Automatic Transaxle Workshop Manual FS5A–EL

CONTENTS

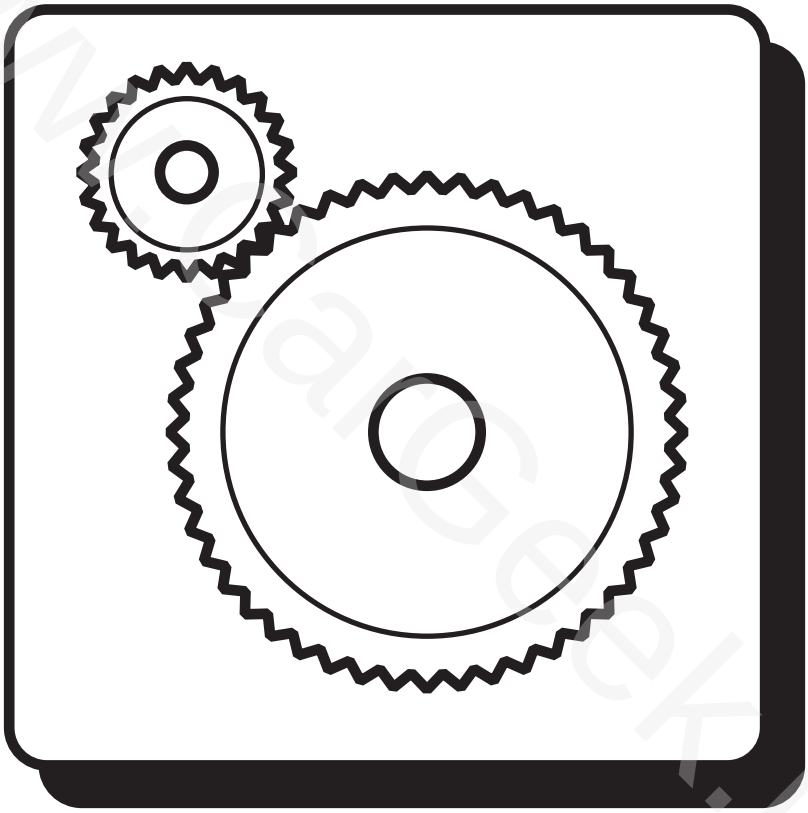
PRINTED IN U.S.A., JUNE 2005
Form No. 1859–1U–05F
Part No. 9999–95–FS5A–06

FOREWORD

This manual explains the service points for the above-indicated automotive system. This manual covers all models with the above-indicated automotive system, not any one specific model.
In order to do these procedures safely, quickly, and correctly, you must first read this manual and any other relevant service materials carefully.
All the contents of this manual, including drawings and specifications, are the latest available at the time of printing.
As modifications affecting repair or maintenance occur, relevant information supplementary to this volume will be made available at Mazda dealers.
This manual should be kept up-to-date.
Mazda Motor Corporation reserves the right to alter the specifications and contents of this manual without obligation or advance notice.

Mazda Motor Corporation
HIROSHIMA, JAPAN

FEATURES



05–17 AUTOMATIC TRANSAXLE

AUTOMATIC TRANSAXLE FEATURES

E6U051700000A01

Realization of excellent shift quality	• Electronic pressure-adjusting control of line pressure by a liner type solenoid (pressure control solenoid A) adopted • Electronic control (direct electric shift control) of clutch pressure by duty-cycle type solenoids (shift solenoid A, B, and C, pressure control solenoid B) adopted
Superior shift quality	• Centrifugal balance clutch chamber adopted
High efficiency, compactness, lightweight	• Miniature trochoid gear oil pump with torque converter direct drive adopted
Improved reliability	• Variable resistor type TR switch has been adopted
Improved marketability	• Sport AT adopted • Sub-shifting mechanism has been adopted
Improved reliability, reduced noise and vibration	• A double arranged gear with a single planetary gear unit is has been adopted as the main shifting mechanism • A single planetary gear unit is has been adopted as the sub-shifting mechanism

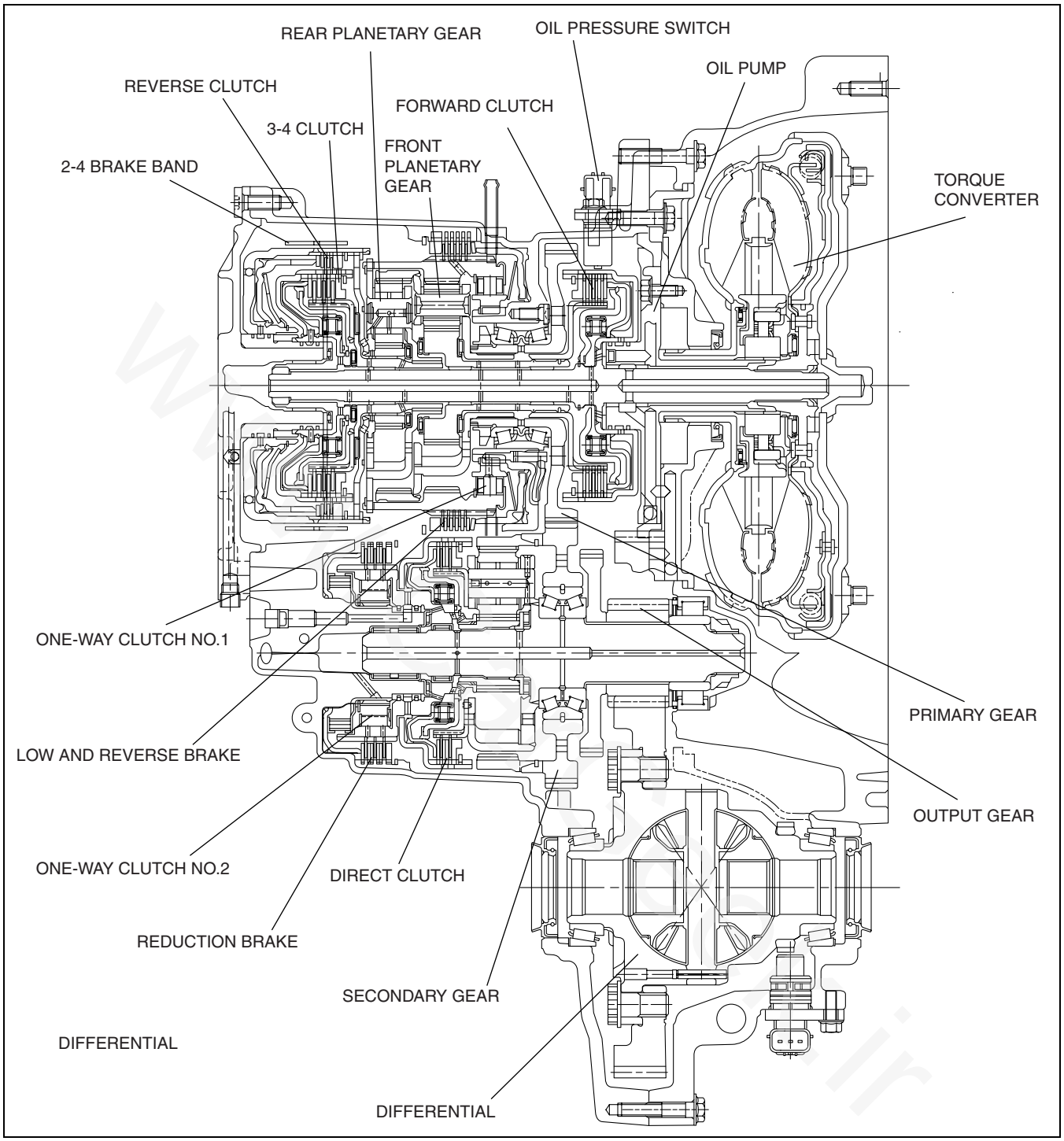
AUTOMATIC TRANSAXLE SPECIFICATIONS

E6U051700000A02

Item			Specification
Engine type			**L3**
Automatic transaxle type			FS5A-EL
Gear ratio		1GR	3.620
		2GR	1.925
		3GR	1.285
		4GR	0.939
		5GR	0.692
		Reverse	3.405
Final gear ratio			3.863
ATF	Type		ATF M-V
	Capacity (Approx. quantity)	(L {US qt, Imp qt})	8.14 {8.60, 7.16}
Torque converter stall torque ratio			1.84
Hydraulic system (Number of drive/driven gear plates)	Forward clutch		4/4
	3-4 clutch		3/3
	Reverse clutch		2/2
	Direct clutch		2/3
	Low and reverse brake		5/5
	Reduction brake		3/5
Band servo	Servo diameter (Piston outer dia.)	(mm {in})	64.6 {2.54}
Front planetary gear (Number of teeth)	Front sun gear		49
	Front pinion gear		20
	Front internal gear		89
Rear planetary gear (Number of teeth)	Rear sun gear		37
	Rear pinion gear		30
	Rear internal gear		98
Primary gear (number of teeth)			86
Secondary gear (number of teeth)			82
Secondary planetary gear (Number of teeth)	Secondary sun gear		31
	Secondary pinion gear		29
	Secondary internal gear		89
Output gear (number of teeth)			22
Ring gear (number of teeth)			85

AUTOMATIC TRANSAXLE CROSS-SECTIONAL VIEW

E6U051700000A03

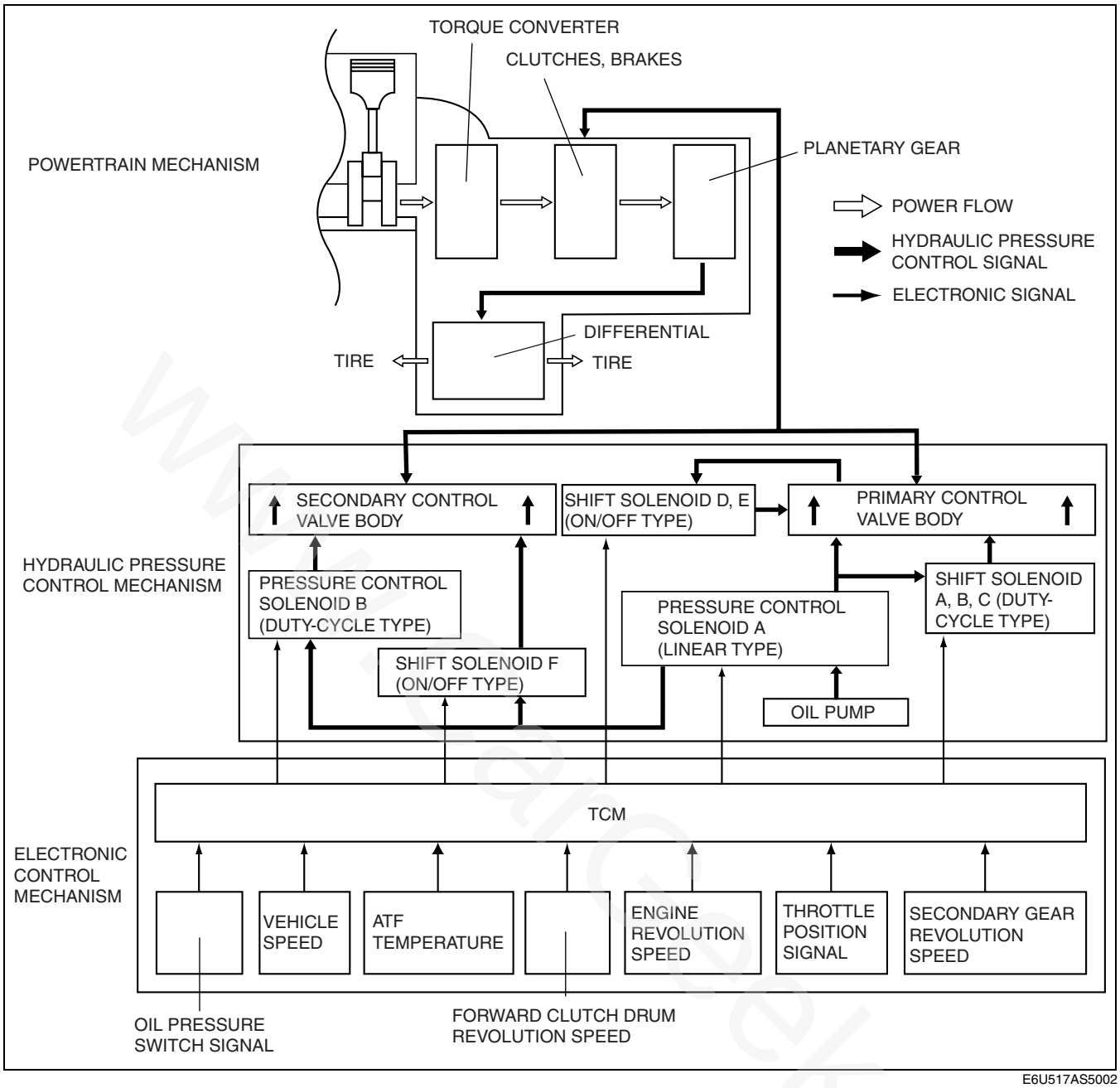


E6U517AS5001

OUTLINE OF OPERATION

E6U051700000A04

- The operation of the electronic automatic transaxle is classified into three systems: the electronic control mechanism, the hydraulic pressure control mechanism, and the powertrain mechanism (includes the torque converter mechanism). The operation of each system is as follows:
  - — Electronic control mechanism
    - According to the signals from the switches and sensors in the input system, the TCM outputs the signal which matches the present driving condition to the linear type solenoid, ON/OFF type solenoids and the duty-cycle type solenoids in the hydraulic pressure control mechanism.
  - — Hydraulic pressure control mechanism
    - According to the signals from the TCM, each solenoid operates to switch the hydraulic passages in the control valve body and controls the clutch engagement pressure.
    - The line pressure is adjusted by the linear type pressure control solenoid A and duty-cycle type pressure control solenoid B. The hydraulic passages are switched by the ON/OFF type solenoids (shift solenoid D and E.) And the clutch engagement pressure is controlled by the duty-cycle type solenoids (shift solenoid A, B, and C) and ON/OFF type solenoid (shift solenoid F).
  - — Powertrain mechanism
    - The driving force from the engine is transmitted through the torque converter to the transaxle.
    - Shift solenoid A, B, and C (duty-cycle type), pressure solenoid B (duty-cycle type), shift solenoid F (ON/OFF type) or clutch engagement pressure control by the control valve enable the transmitted input driving force to be converted to optimum output driving force via the differential.



E6U517AS5002

EC-AT OPERATION CHART

E6U051700000A05

Position/Range	Mode	Gear position		Shift pattern			Transaxle									
				Shift	TCC	Engine brake	Forward clutch	3–4 clutch	Reverse clutch	Direct clutch	2–4 brake band		Low and reverse brake	Reduction brake	One-way clutch No.1	One-way clutch No.2
											Applied	Released				
P	–	Neutral	–	–												
R	–	Reverse	3.405	–		×			×				×	×		
N	–	Neutral	–	–												
D	*1 POWER/ NORMAL	1GR	3.620	↕			×							×	⊗	×
		2GR	1.925	↕		×	×				×			×		×
		3GR	1.285	↕		×	×	×			×*3	×		×		×
		4GR	0.933	↕		×		×			×			×		×
		4GR *2 TCC ON	0.933	↕	×	×		×			×			×		×
		5GR	0.692	↕		×		×		×	×					
		5GR *2 TCC ON	0.692	↕	×	×		×		×	×					
M	MANUAL	1GR	3.620	⇕		×	×						×	×	⊗	×
		2GR	1.925	⇕		×	×				×			×		×
		3GR	1.285	⇕		×	×	×			×*3	×		×		×
		4GR	0.933	⇕		×		×			×			×		×
		4GR TCC ON	0.933	⇕	×	×		×			×			×		×
		5GR	0.692	⇕		×		×		×	×					
		5GR TCC ON	0.692	⇕	×	×		×		×	×					

⇕ : Automatic shift according to set speed and throttle opening angle
⇕ : Manual shift based on selector lever operation
⇕ : Consecutive shift by tapping selector lever two times in the down-shift (—) direction or up-shift (+) direction
*1 : Automatically switches between POWER and NORMAL modes according to accelerator pedal depressing speed
*2 : Performs TCC operation in NORMAL mode
*3 : Indicates operation although the band servo remains deactivated due to the large area of the release pressure side.
× : Operating
⊗ : Transmits the torque only when driving

D6E517AT5003

Position/Range	Mode	Gear position		Shift pattern			Operation of shift solenoid					
							Solenoid valve (duty-cycle type)			Solenoid valve (ON /OFF type)		
				Shift	TCC	Engine brake	Shift solenoid A	Shift solenoid B	Shift solenoid C	Shift solenoid D	Shift solenoid E	Shift solenoid F
P	–	Neutral	–	–			–	–	–	ON	OFF	ON
R	–	Reverse	3.405	–		×	OPEN	OPEN	OPEN	OFF	OFF	ON
N	–	Neutral	–	–			–	–	–	ON	OFF	ON
D	*1 POWER/ NORMAL	1GR	3.620	↕			OPEN	CLOSE	CLOSE	OFF	OFF	ON
		2GR	1.925	↕		×	OPEN	OPEN	CLOSE	OFF	OFF	ON
		3GR	1.285	↕		×	OPEN	OPEN	OPEN	OFF	OFF	ON
		4GR	0.933	↕		×	CLOSE	OPEN	OPEN	ON	OFF	ON
		4GR *2 TCC ON	0.933	↕	×	×	CLOSE	OPEN	OPEN	ON	ON	ON
		5GR	0.692	↕		×	CLOSE	OPEN	OPEN	ON	OFF	OFF
		5GR *2 TCC ON	0.692	↕	×	×	CLOSE	OPEN	OPEN	ON	ON	OFF
M	MANUAL	1GR	3.620	⇕		×	OPEN	OPEN	CLOSE	ON	ON	ON
		2GR	1.925	⇕		×	OPEN	OPEN	CLOSE	OFF	OFF	ON
		3GR	1.285	⇕		×	OPEN	OPEN	OPEN	OFF	OFF	ON
		4GR	0.933	⇕		×	CLOSE	OPEN	OPEN	ON	OFF	ON
		4GR TCC ON	0.933	⇕	×	×	CLOSE	OPEN	OPEN	ON	ON	ON
		5GR	0.692	⇕		×	CLOSE	OPEN	OPEN	ON	OFF	OFF
		5GR TCC ON	0.692	⇕	×	×	CLOSE	OPEN	OPEN	ON	ON	OFF

↕ : Automatic shift according to set speed and throttle opening angle
⇕ : Manual shift based on selector lever operation
↕ : Consecutive shift by tapping selector lever two times in the down-shift (—) direction or up-shift (+) direction
*1 : Automatically switches between POWER and NORMAL modes according to accelerator pedal depressing speed
*2 : Performs TCC operation in NORMAL mode
× : Operating

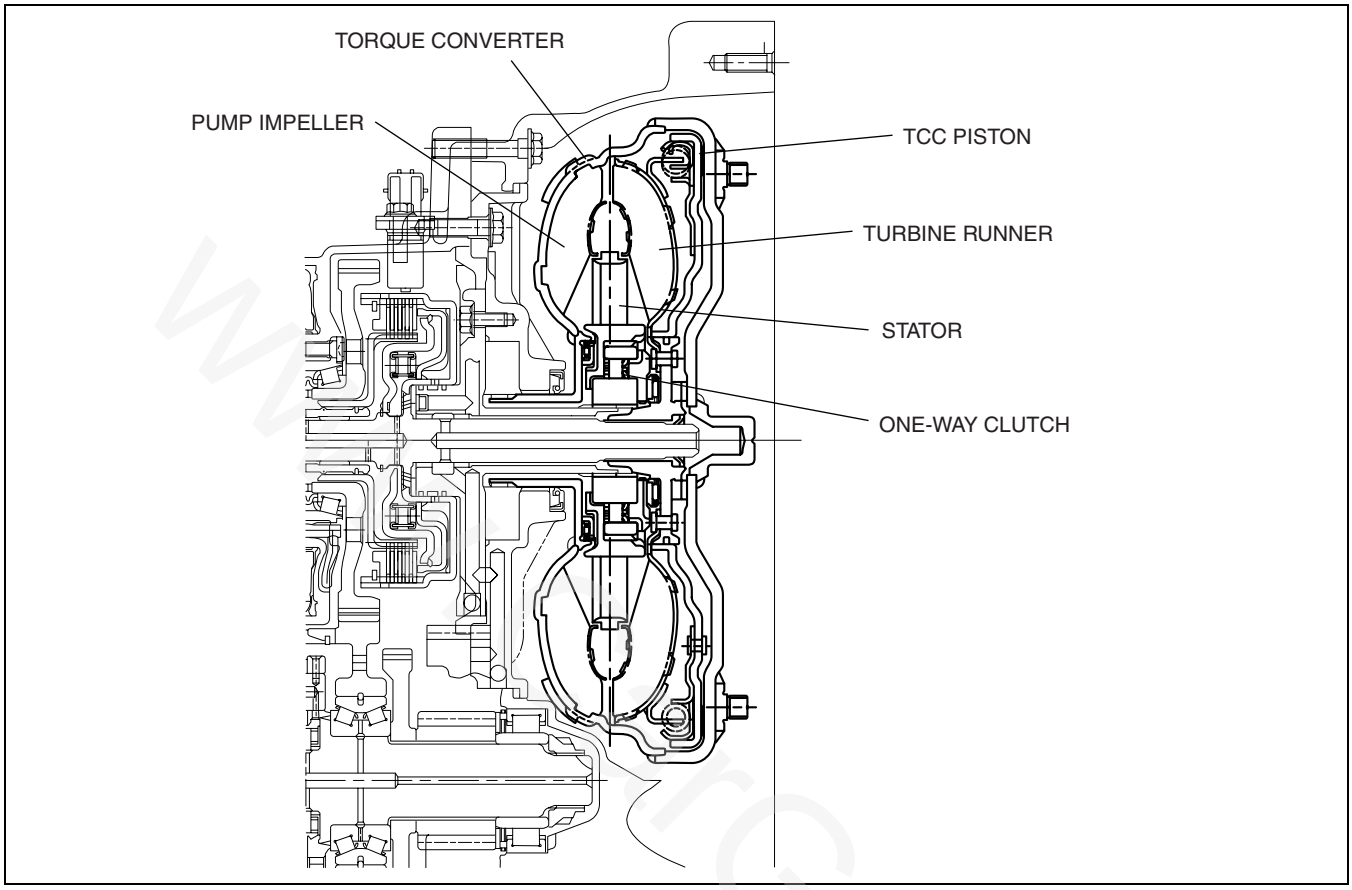
OPEN: Engages the line pressure to the clutch pressure (Solenoid de-energized)
CLOSE: Drains the clutch pressure (Solenoid energized)
ON: Engages the output port and the supply port (Solenoid reducing pressure)
OFF: Engages the output port and the drain port (Drains the output port)

D6E517AT5004

TORQUE CONVERTER OUTLINE

E6U051719100A01

- The torque converter clutch mechanism mechanically engages the pump impeller and the turbine runner under a specified condition, and transmits the power, not through the fluid, but directly, preventing the slip loss of the torque converter.
- The torque converter has obtained sufficient transaxle efficiency and torque converting ratio that matches the output characteristic of each engine.

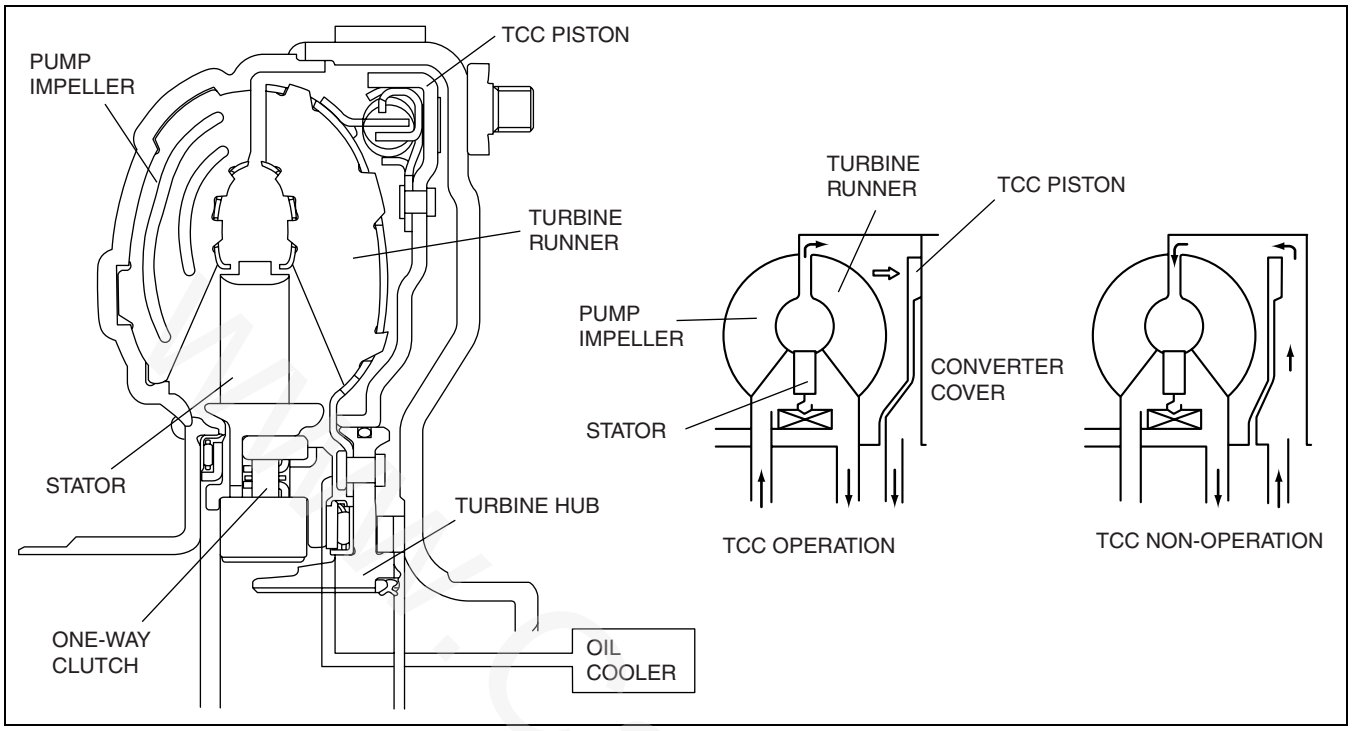


E6U517AS5021

TORQUE CONVERTER STRUCTURE

E6U051719100A02

- The torque converter with the TCC control consists of the turbine runner, pump impeller, stator, and the TCC piston as shown in the figure. The TCC piston engages with the turbine runner and slides on the turbine hub to be pushed and contacts with the torque converter cover during the TCC control operation. In the TCC piston, a spring for torsion damper is installed to absorb the engine torque fluctuation during TCC control.



E6U517YA6001

POWER FLOW OUTLINE

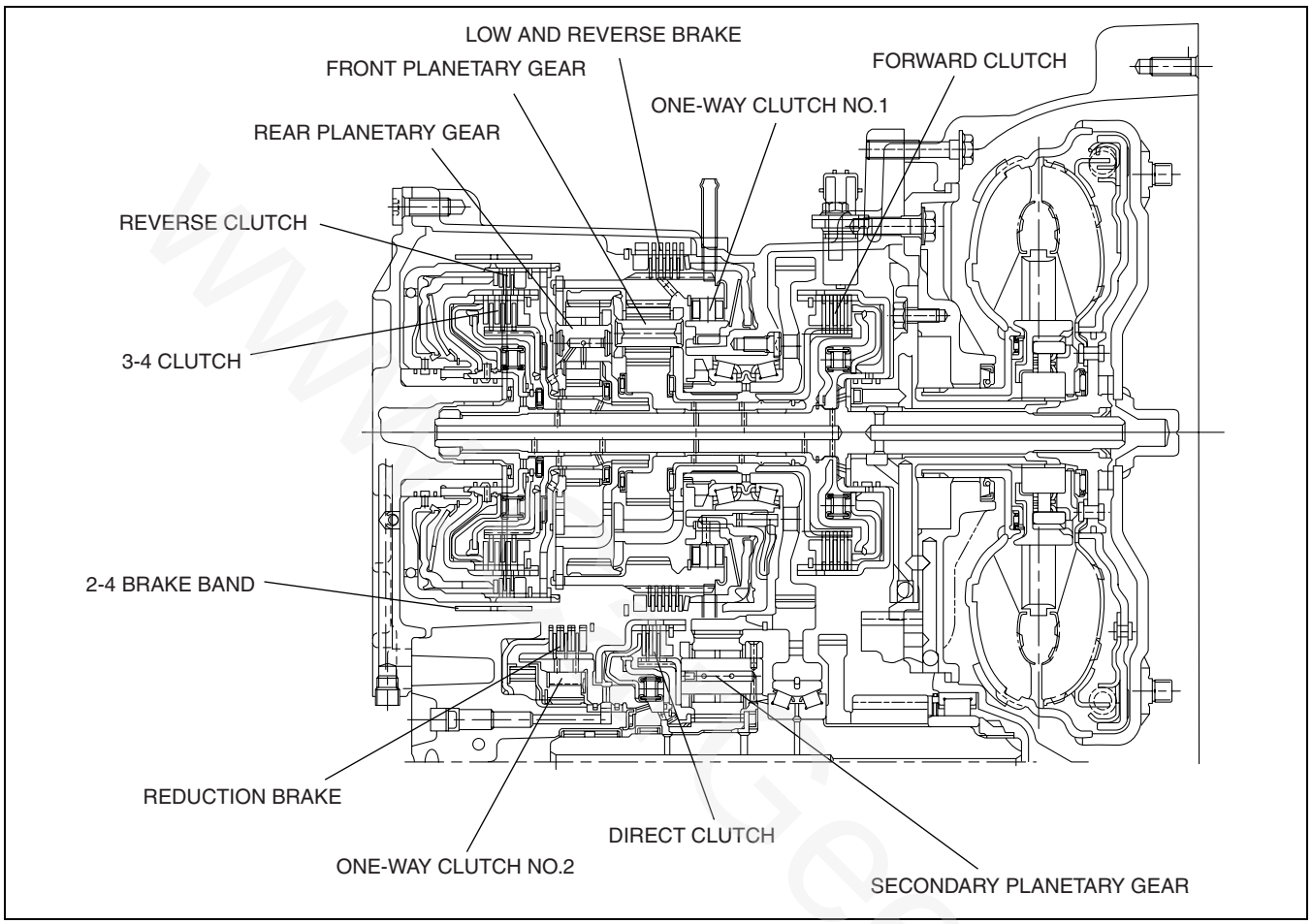
E6U051700000A06

- In the powertrain mechanism, hydraulic pressure is transmitted from the control valves or shift solenoid A, B, C (duty-cycle type), pressure control solenoid B (duty-cycle type) or shift solenoid F (ON/OFF type) operate the clutches and brakes, and the planetary gear changes the gear ratio according to the vehicle driving condition.

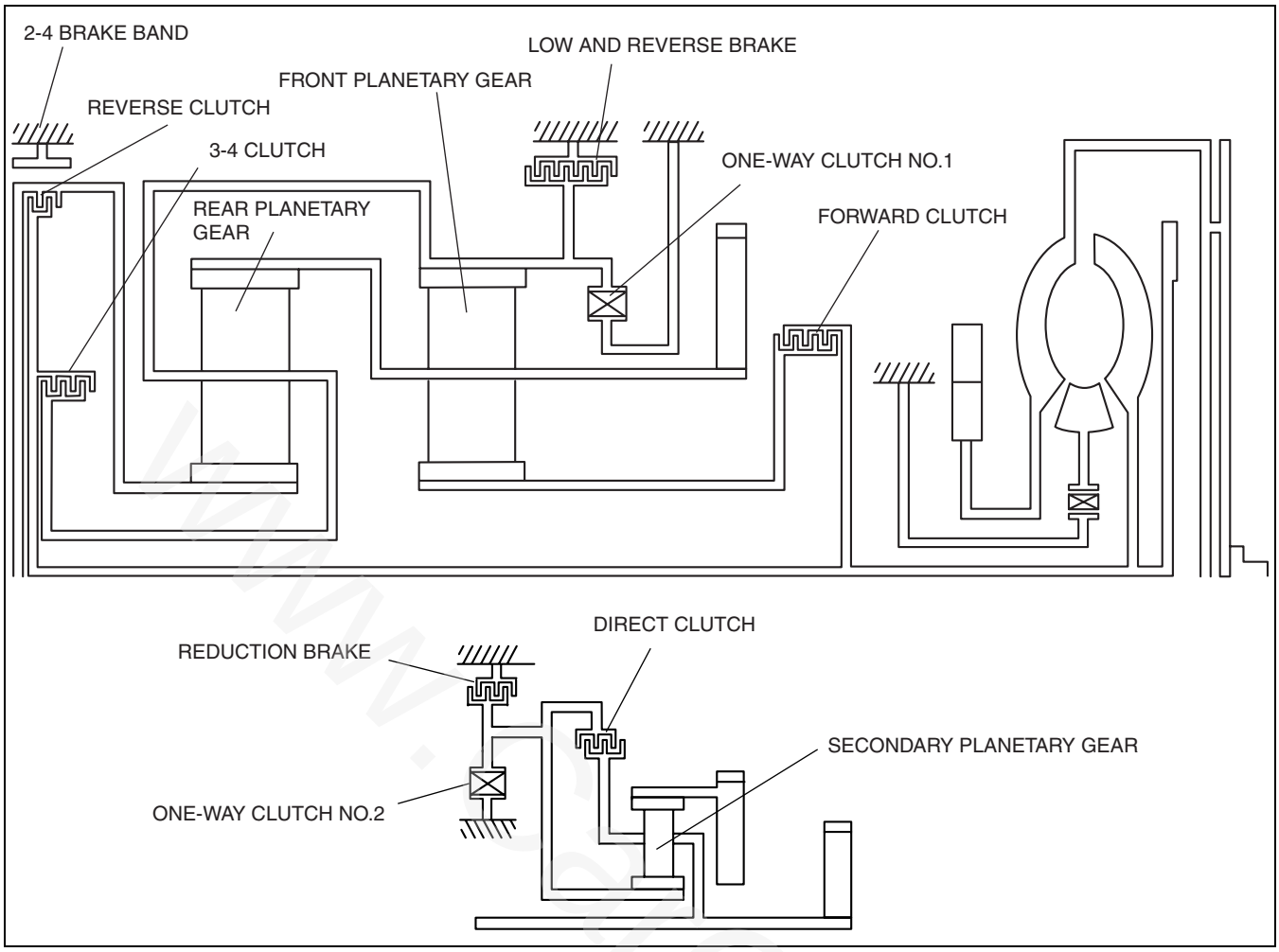
POWER FLOW STRUCTURE

E6U051700000A07

- The powertrain mechanism of the FS5A-EL type consists of four pairs of clutches, two pairs of brakes, band brake, two pairs of one-way clutches, and three pairs of single type planetary gears.



E6U517AS5003



E6U517AS5004

POWER FLOW OPERATION

E6U051700000A08

Component description

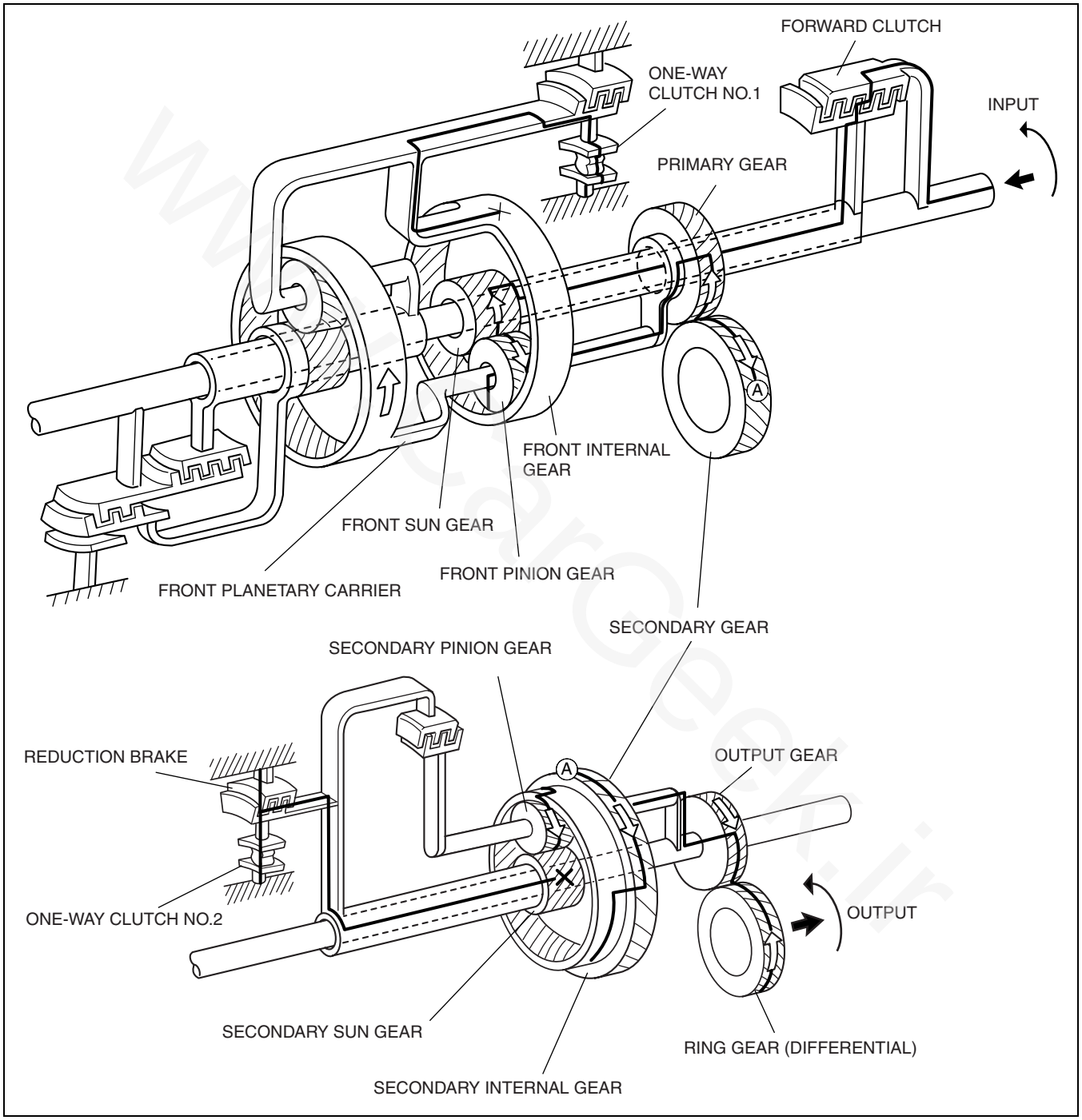
Component	Function
Forward clutch	• Transmits the input torque from the turbine shaft to the front sun gear. • Operates in the forward range of the first, second, or third gear position.
3-4 clutch	• Transmits the input torque from the turbine shaft to the rear planetary carrier. • Operates in the forward range of the third, fourth or fifth gear position.
Reverse clutch	• Transmits the input torque from the turbine shaft to the rear sun gear. • Operates when the vehicle is backing up.
Direct clutch	• Engage the secondary planetary carrier and the secondary sun gear. • Operates in the fifth gear position.
2-4 brake band	• Locks rotation of the reverse drum and fixes the rear sun gear. • Operates in the second or fourth gear position.
Low and reverse brake	• Fixes the rotation of the front internal gear. • Operates when the vehicle is backing up or in the first gear position (M range 1GR).
Reduction brake	• Fixes the rotation of the secondary sun gear. • Operates when the vehicle is backing up. • Operates in the first, second, third or fourth gear position.
One-way clutch No.1	• Locks the counterclockwise rotation of the front internal gear in the first gear position.
One-way clutch No.2	• Operates in the first, second, third or fourth gear position.
Front planetary gear	• The front planetary gear and rear planetary gear functions as a transmission due to the engagement/ disengagement of clutches and/or brakes, converts the transmitted driving force of the turbine shaft and transmits it to the primary gear.
Rear planetary gear	

Component	Function
Secondary planetary gear	• The secondary planetary gear functions as a transmission due to the engagement/ disengagement of clutches and/or brakes, converts the transmitted driving force of the turbine shaft and transmits it to the output gear.

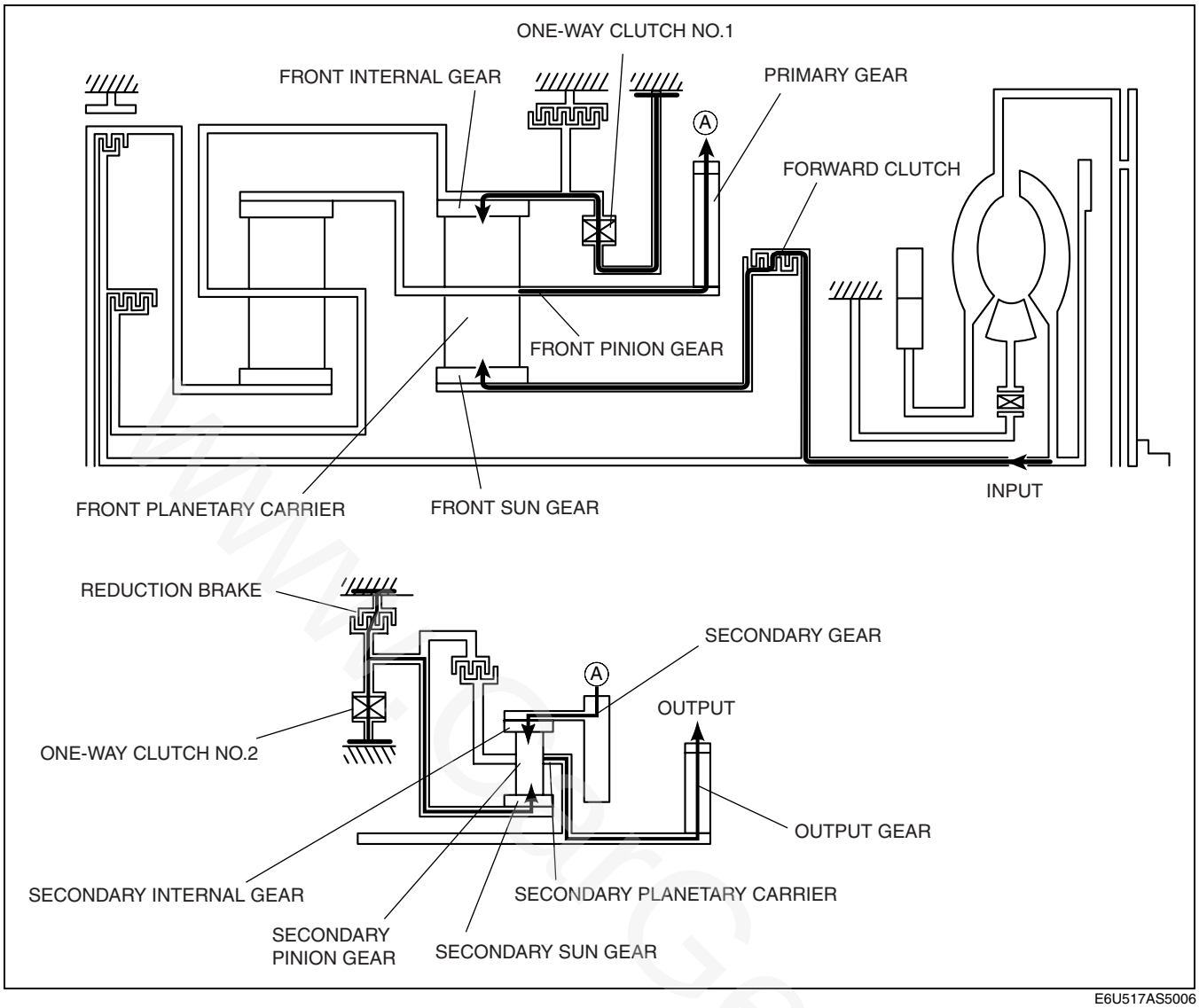
Note

- All directions of rotation are viewed from the torque converter.

1GR (D range)

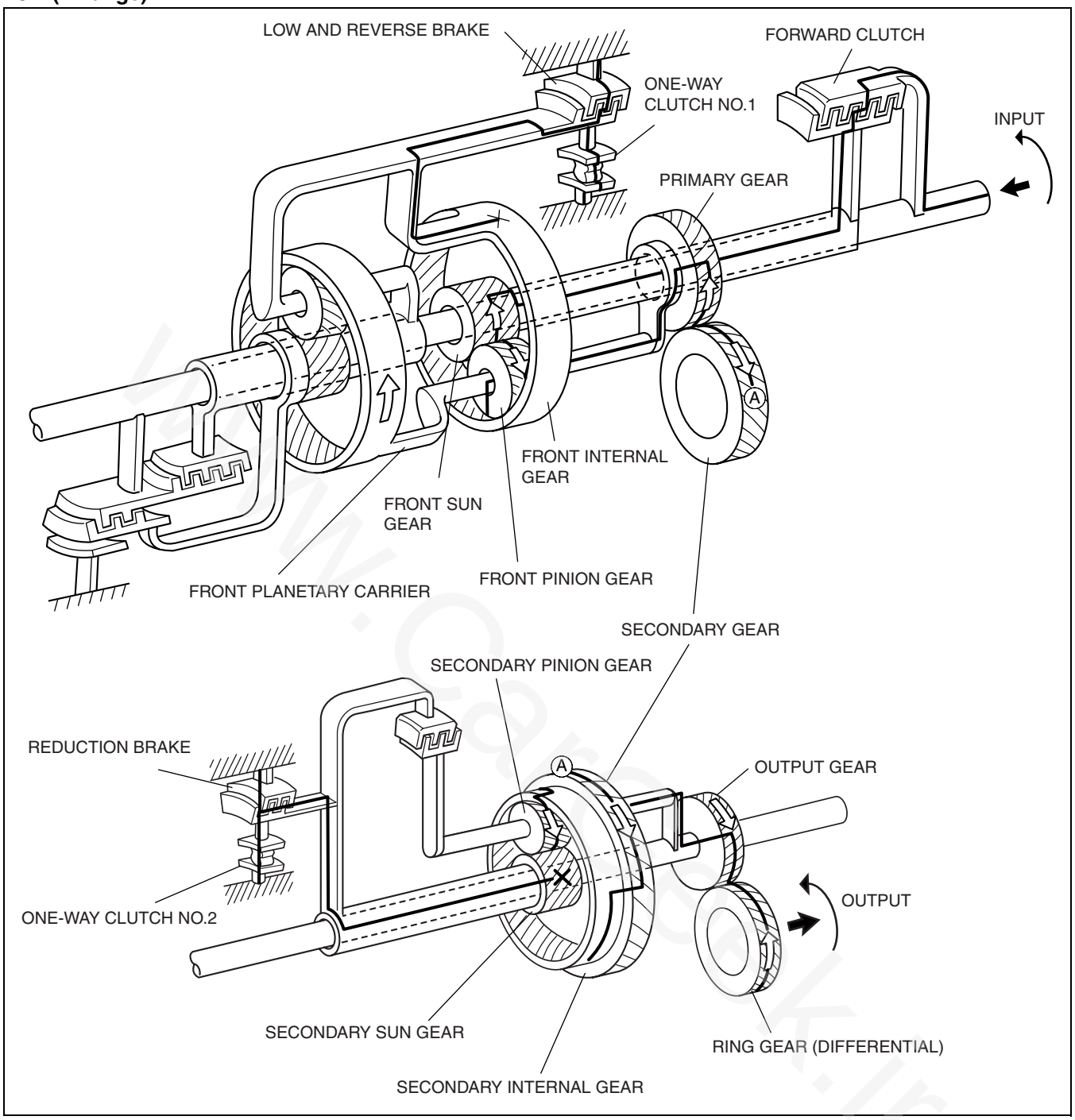


E6U517AS5005

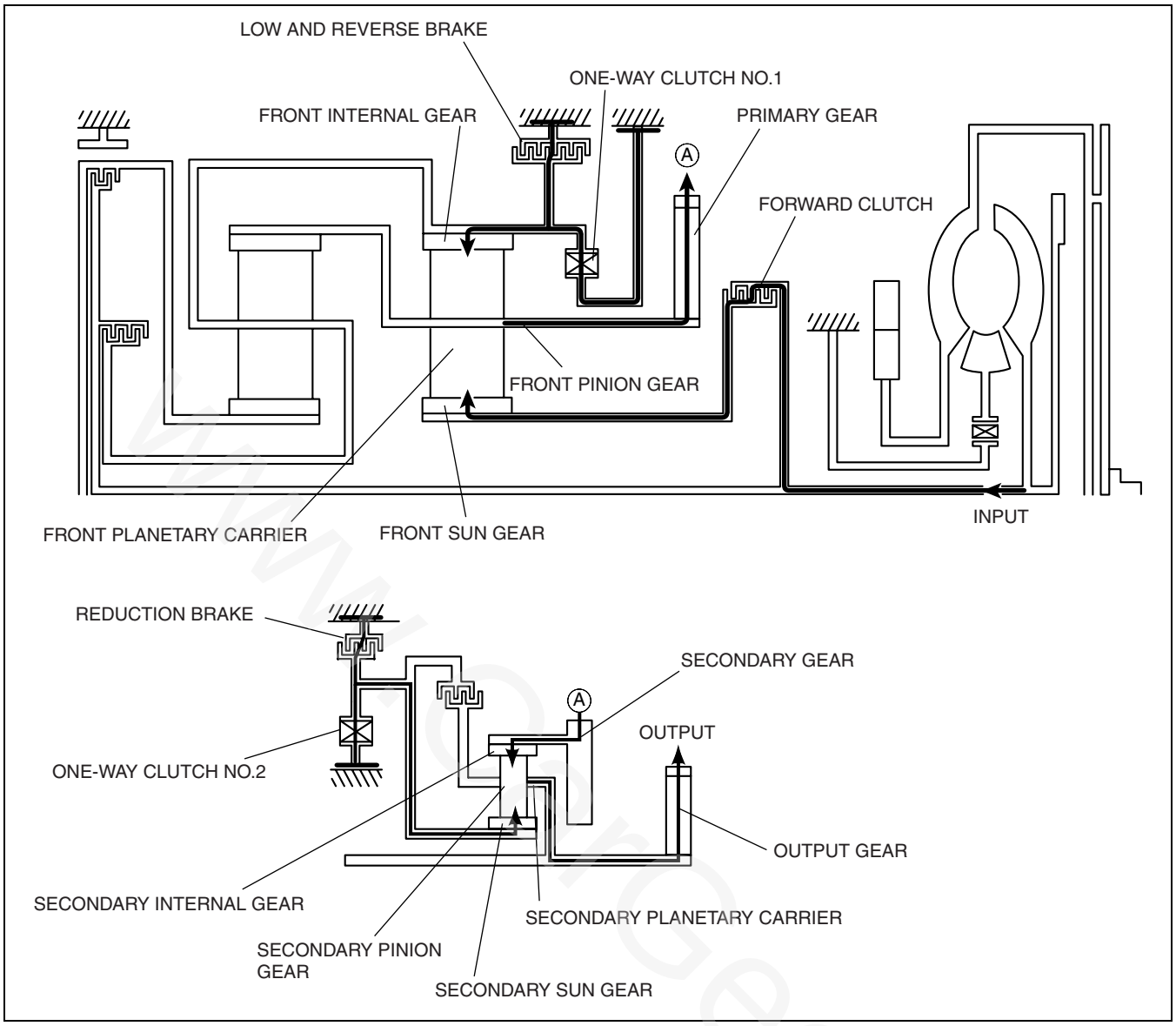


E6U517AS5006

1GR (M range)

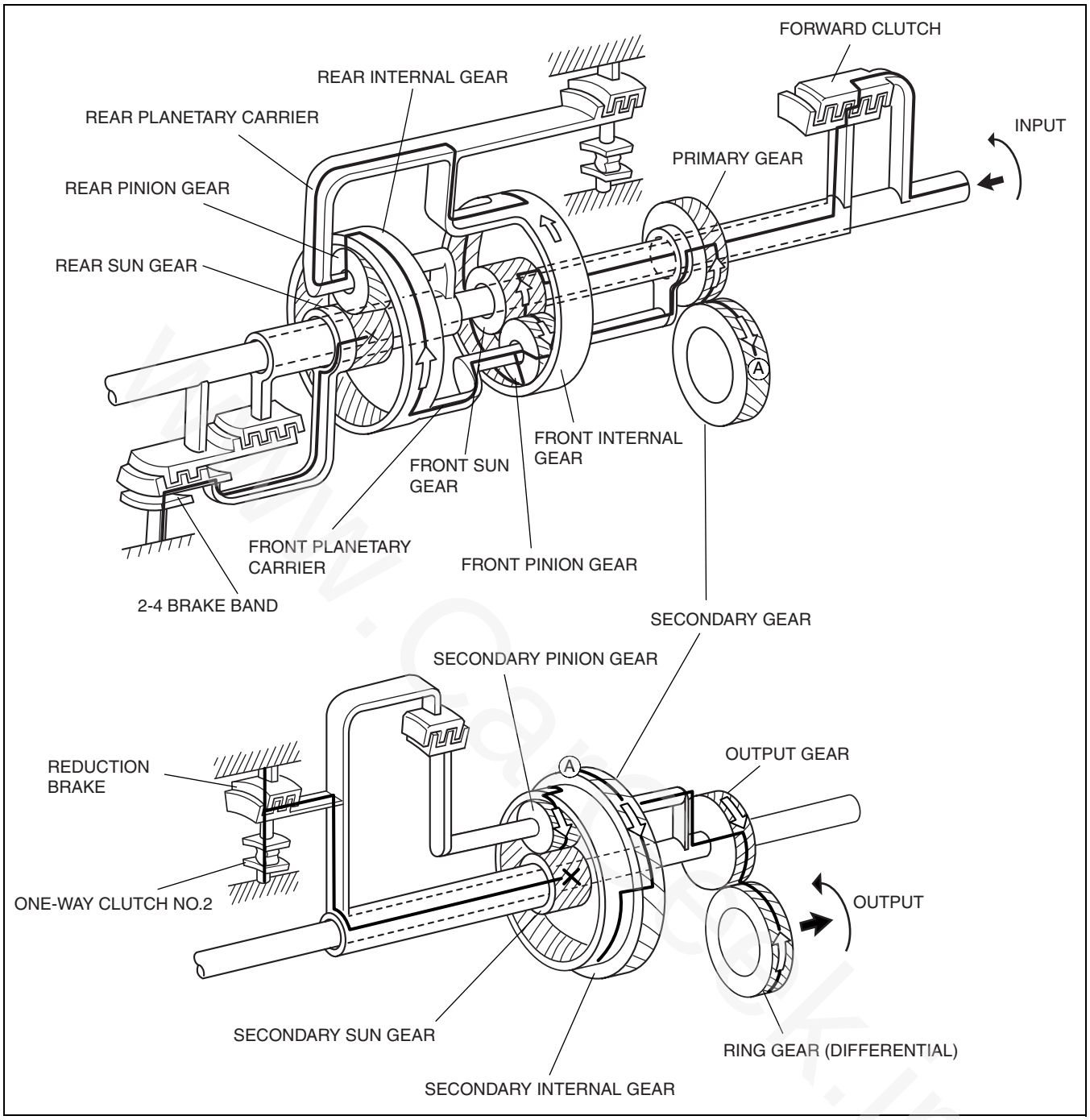


E6U517AS5007

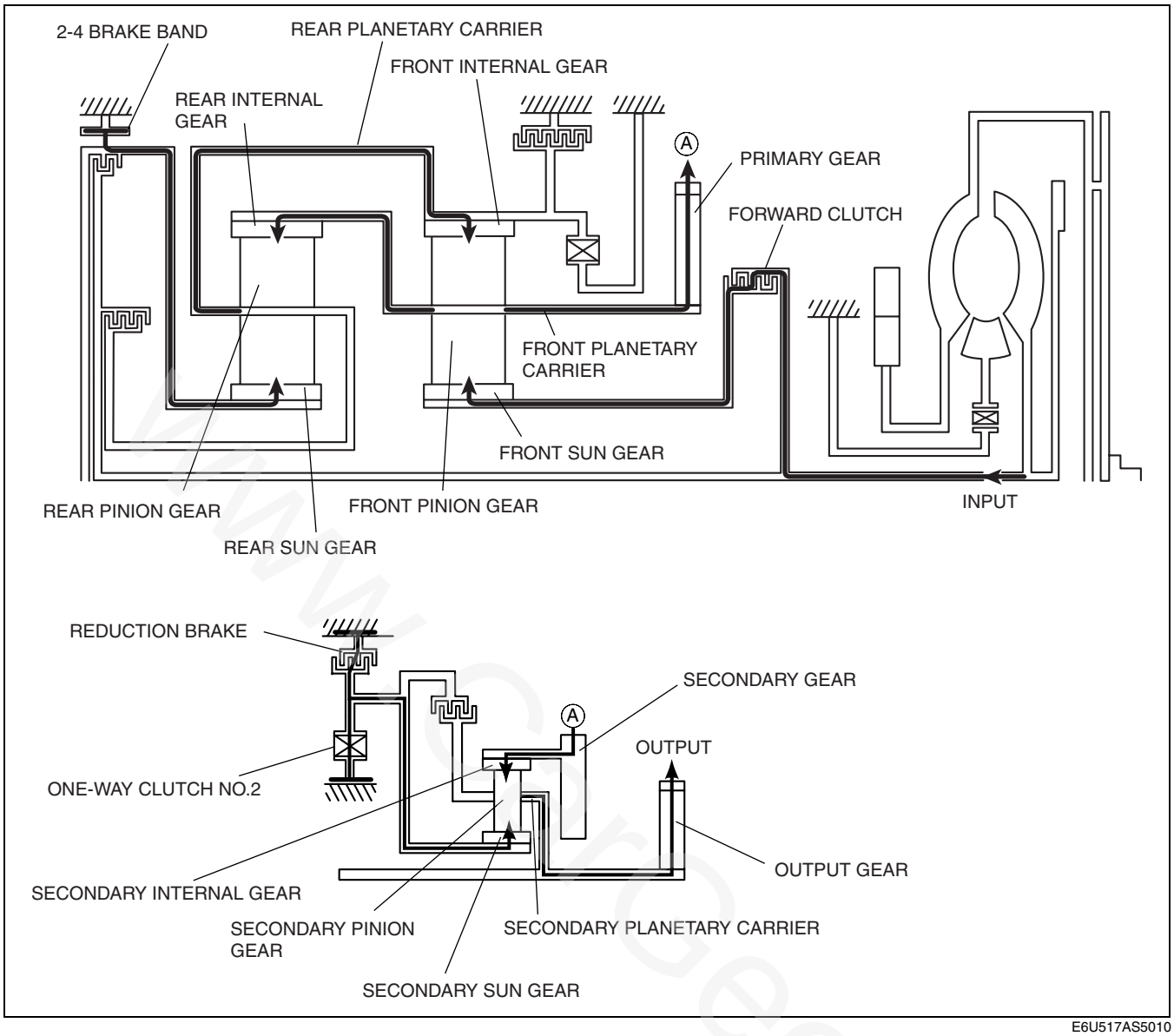


E6U517AS5008

2GR

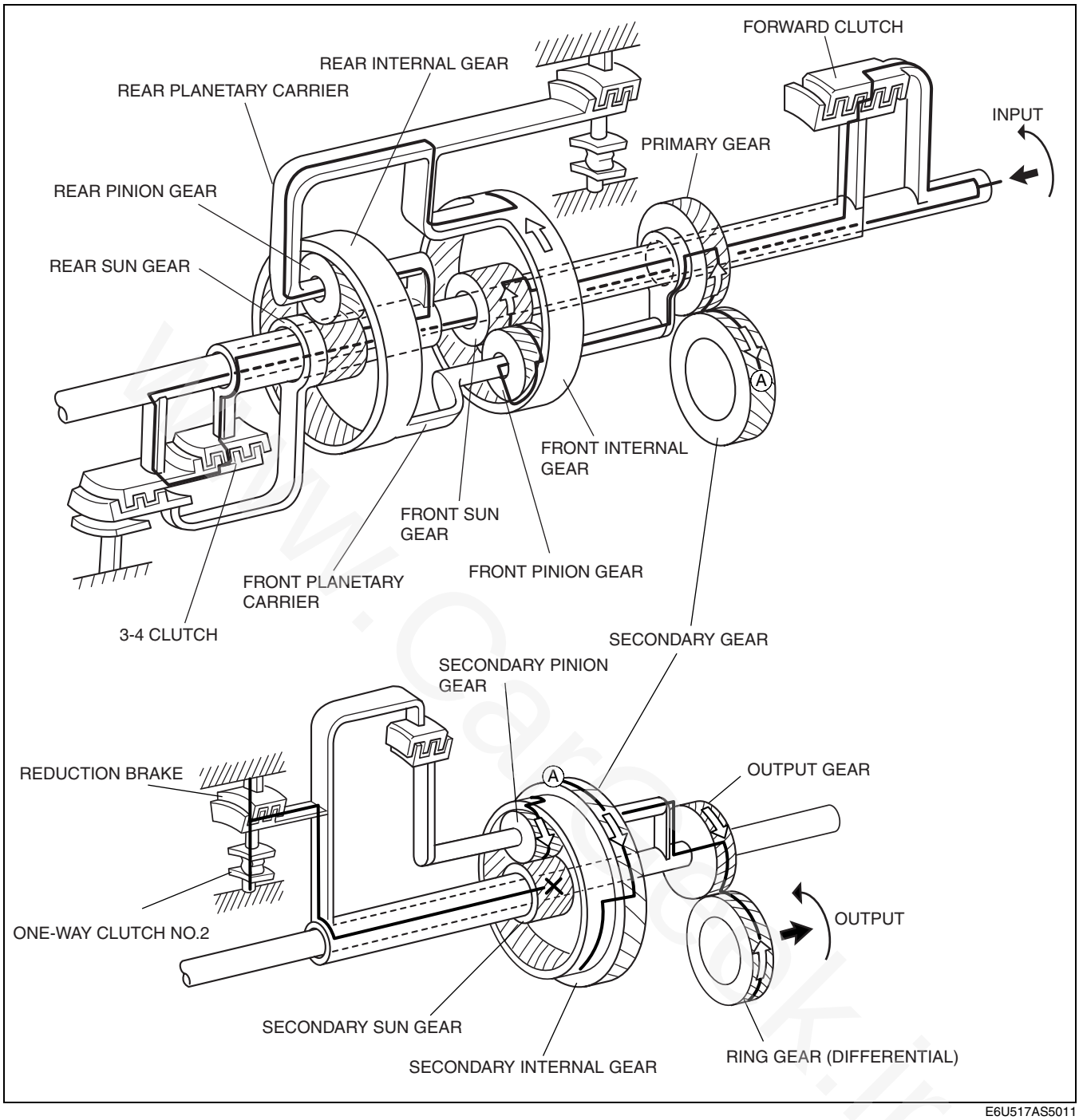


E6U517AS5009

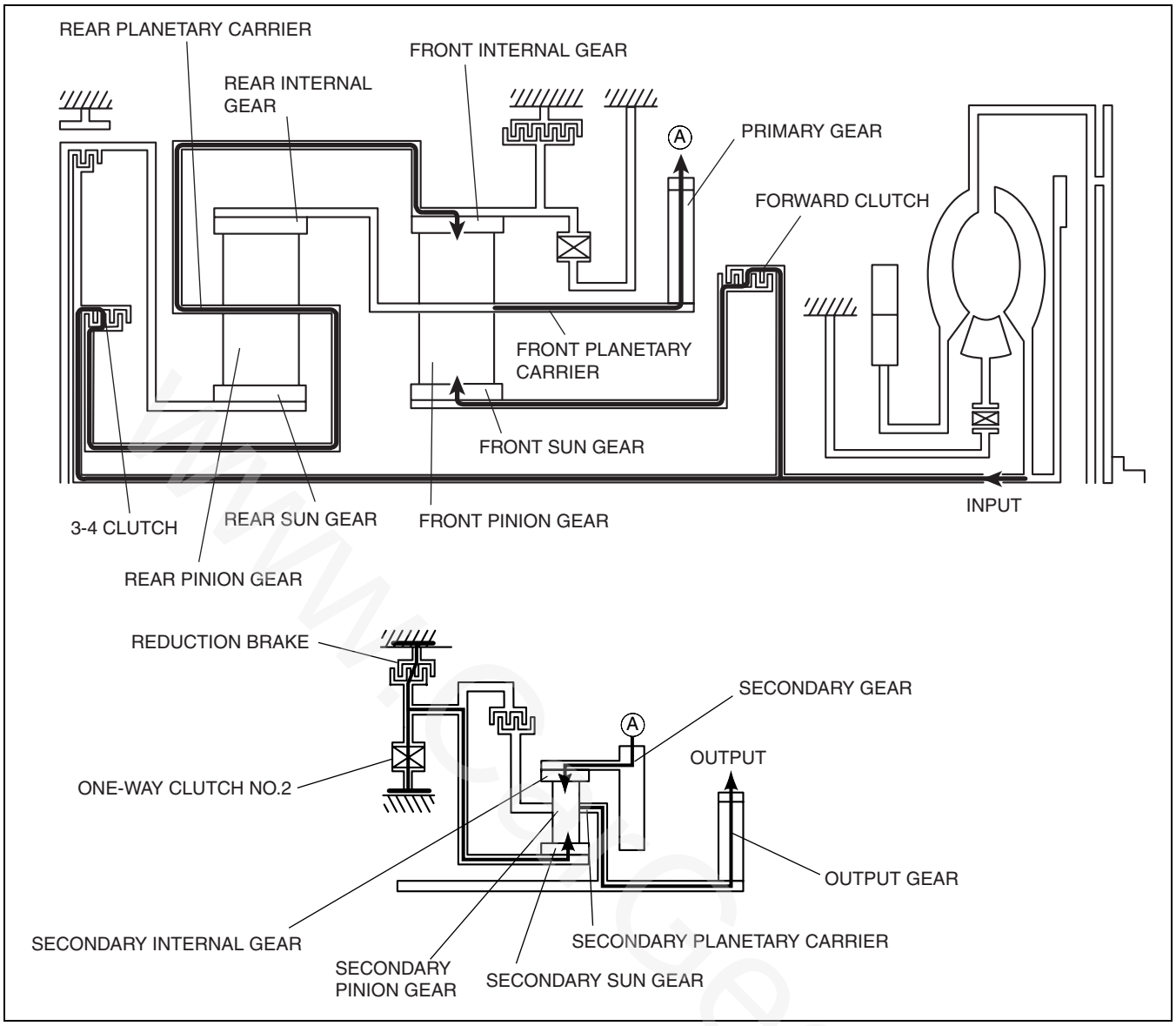


E6U517AS5010

3GR

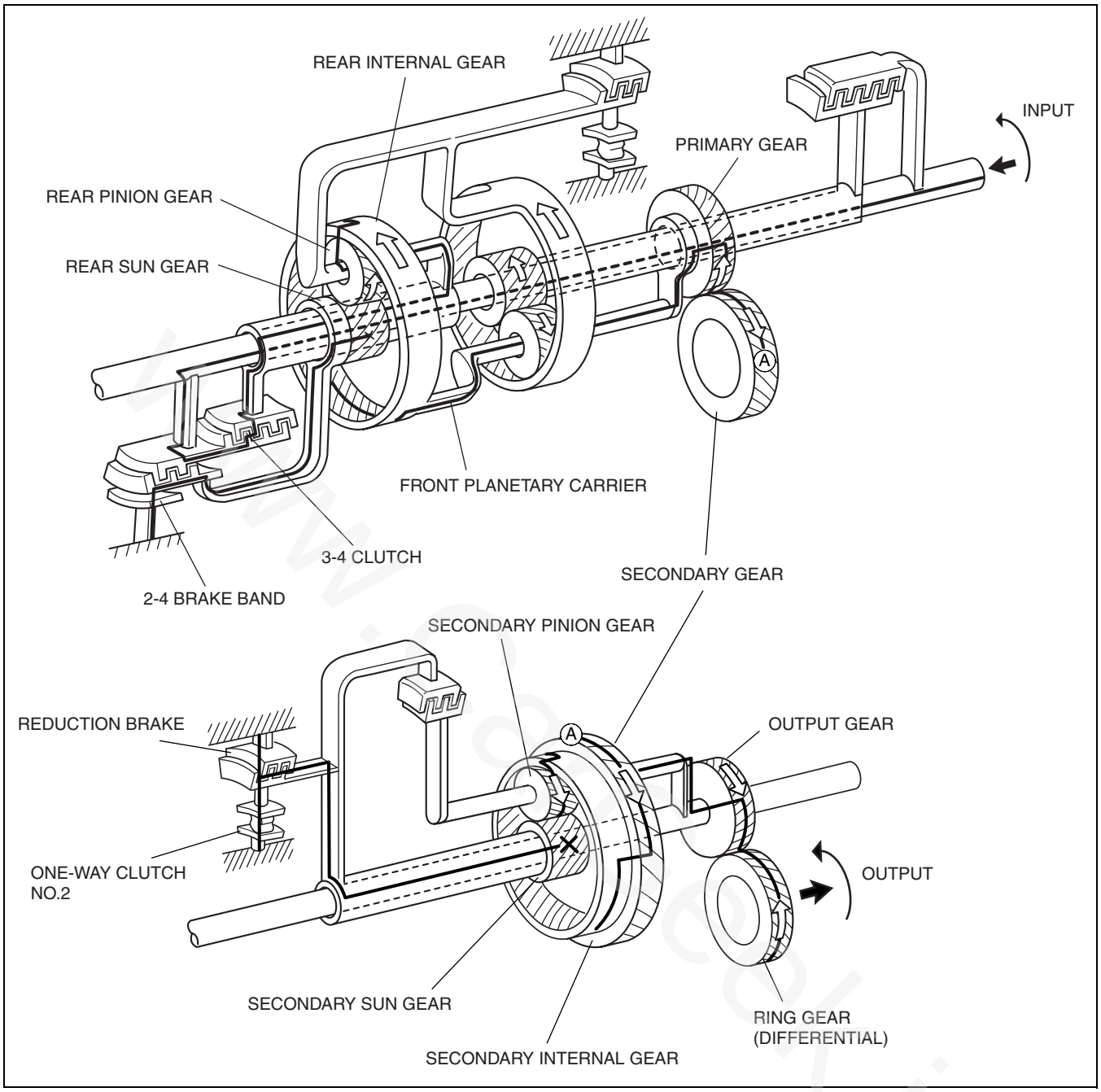


E6U517AS5011

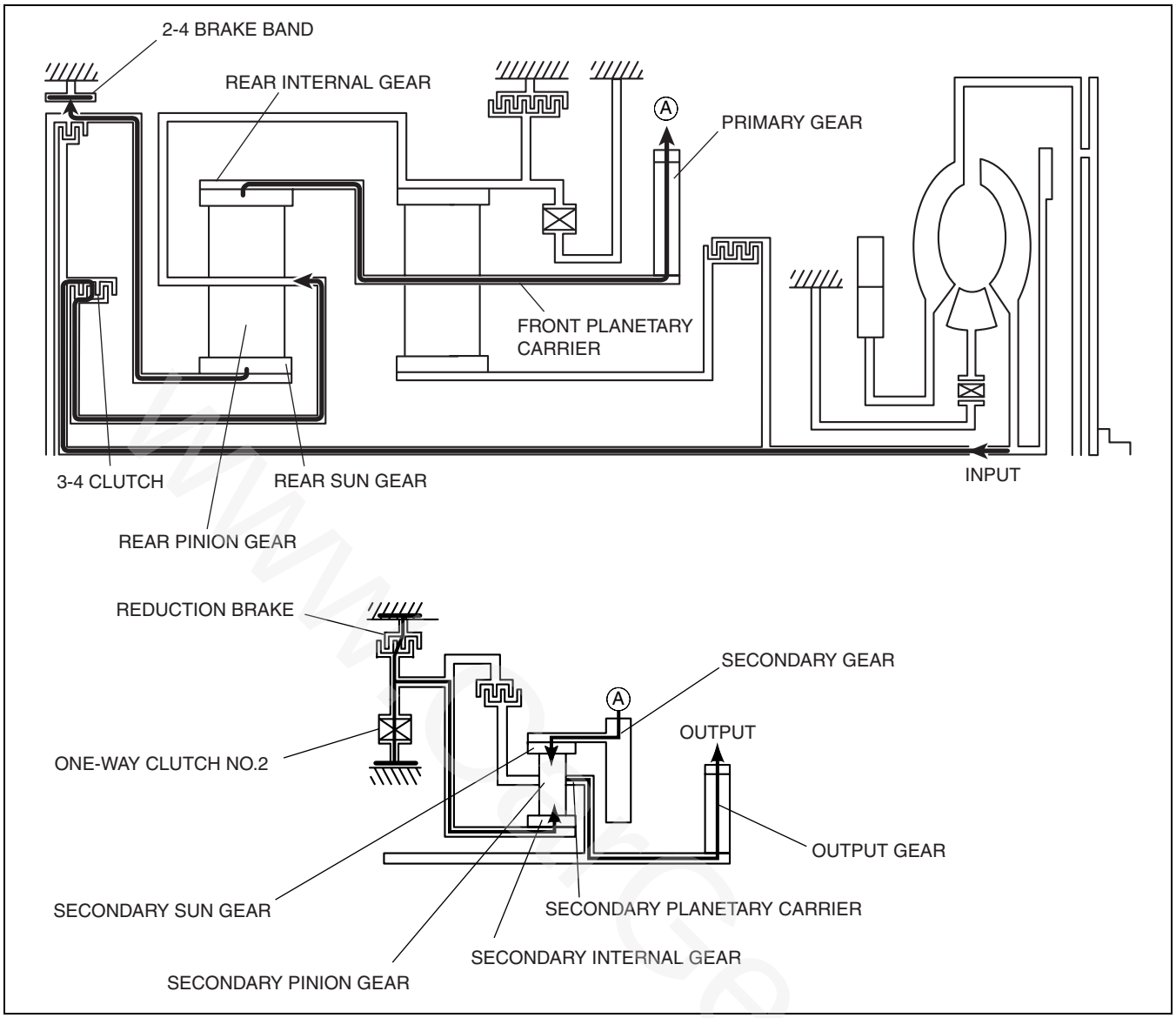


E6U517AS5012

4GR

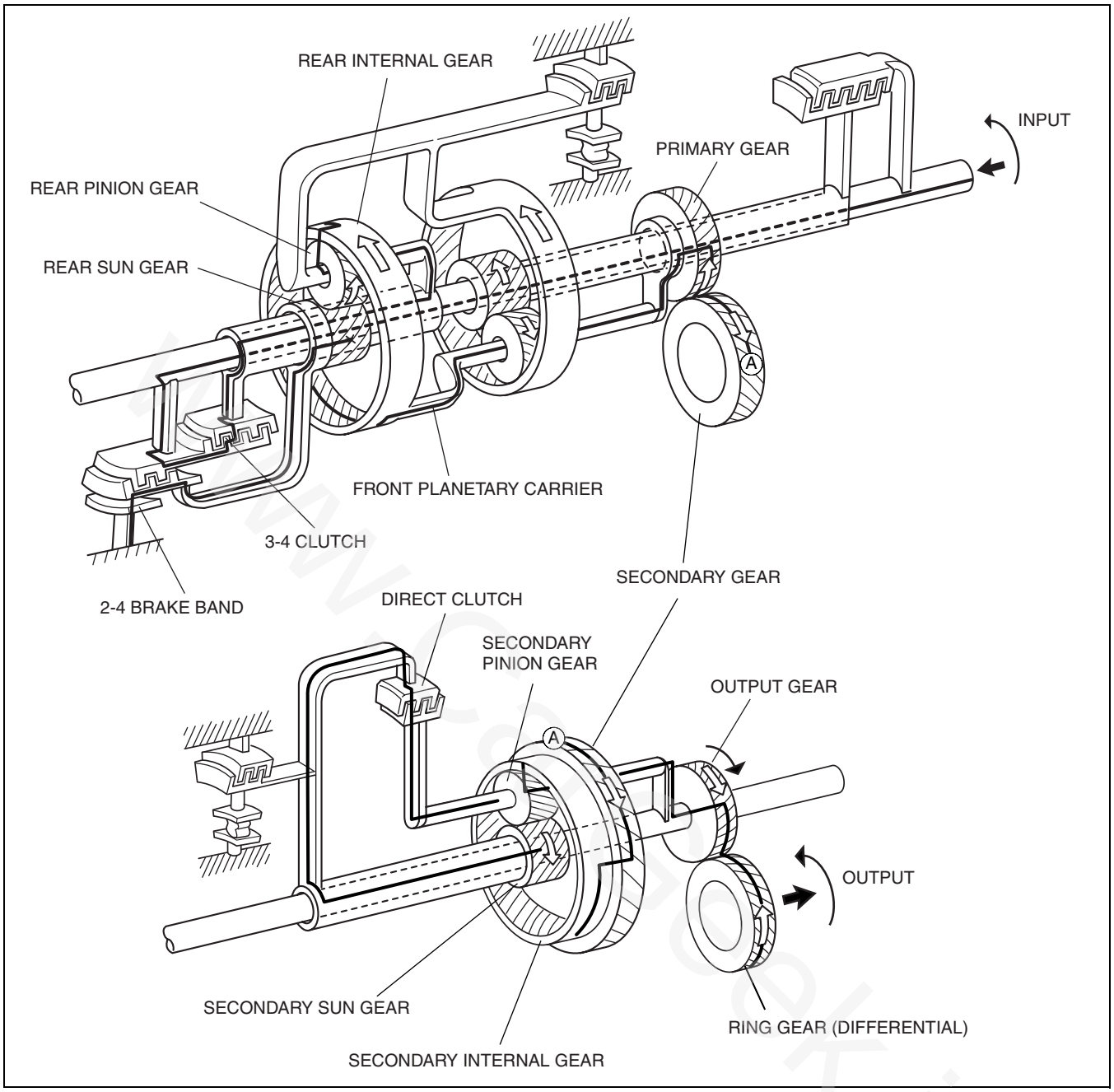


E6U517AS5013

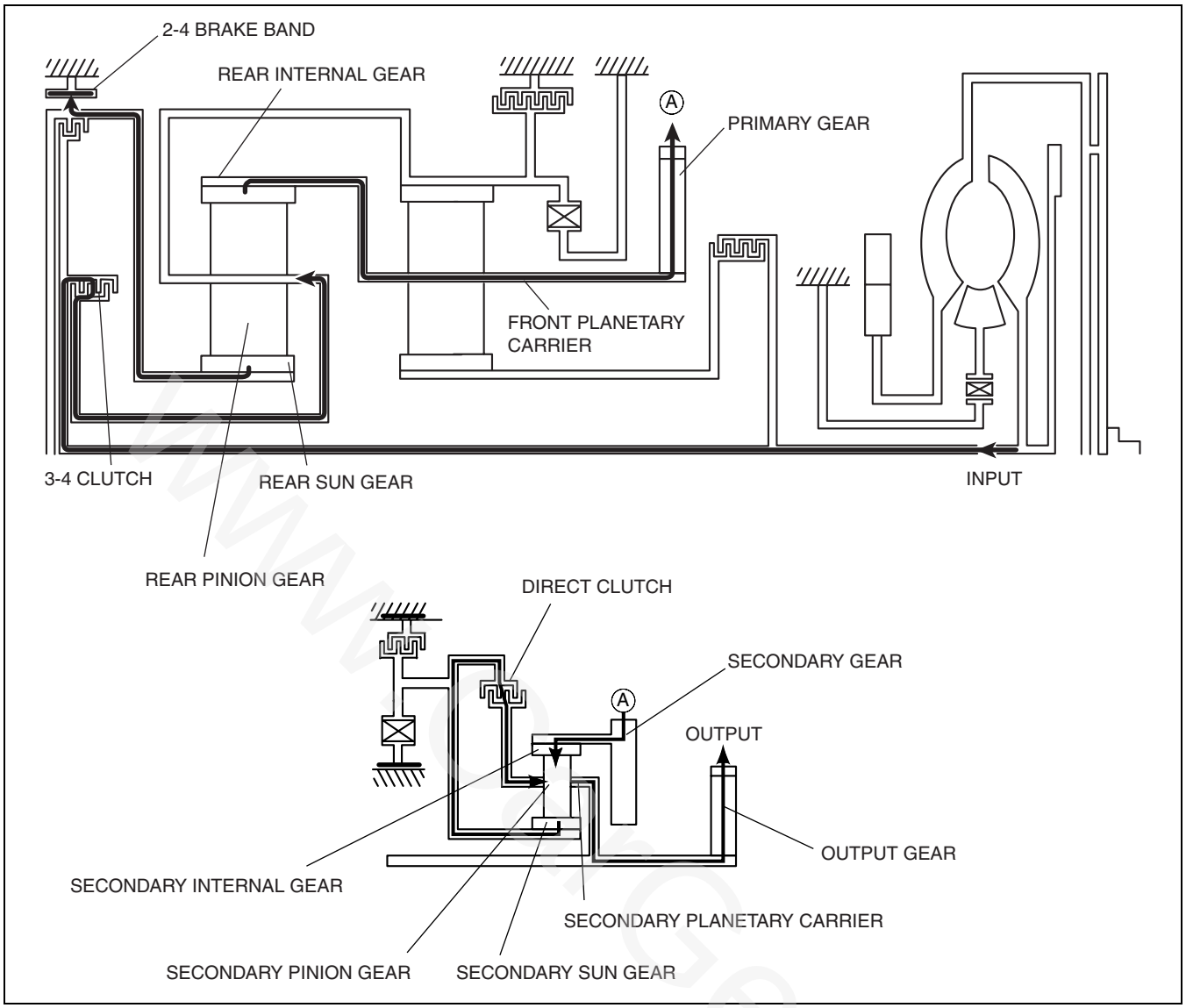


E6U517AS5014

5GR

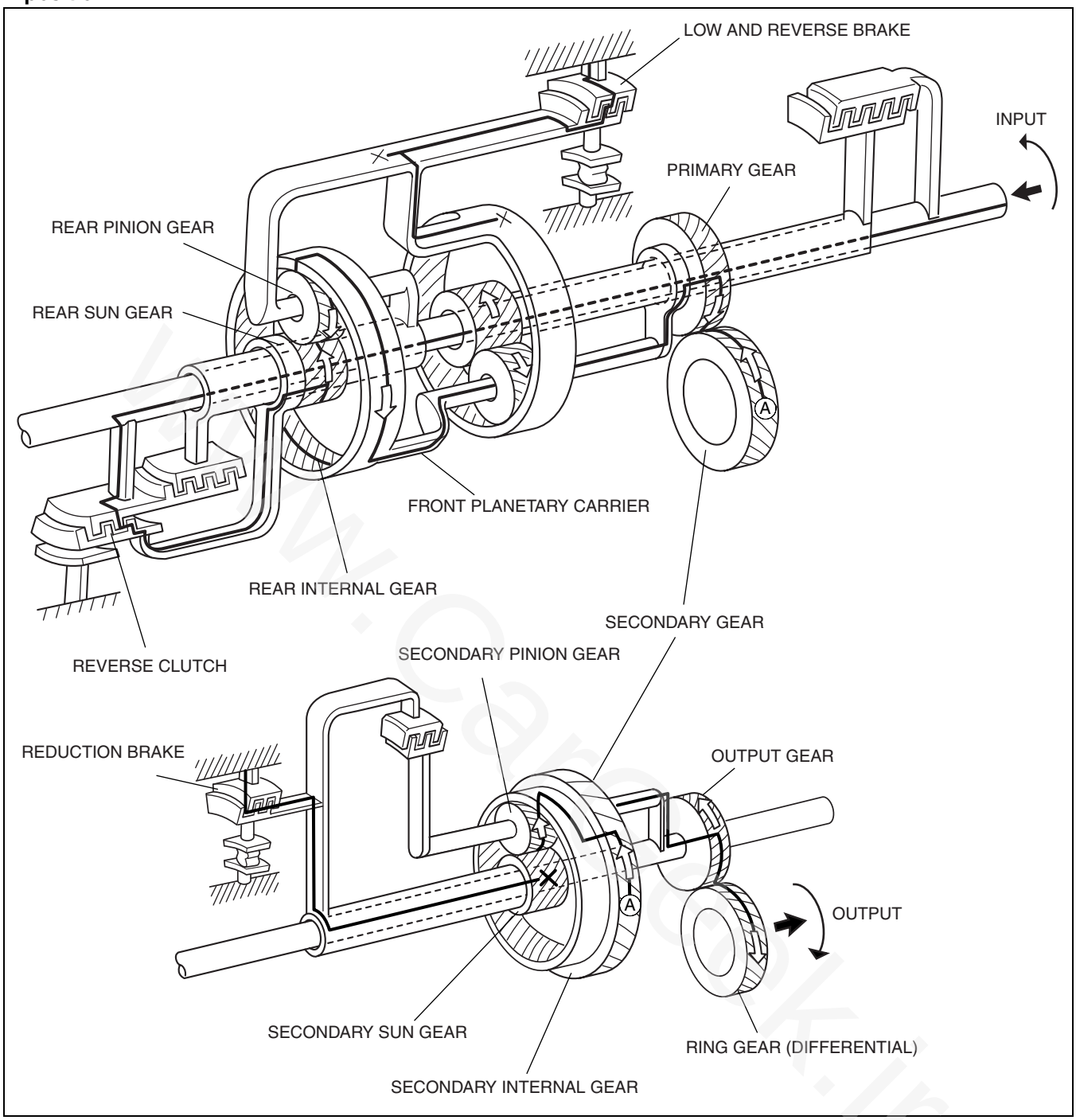


E6U517AS5015

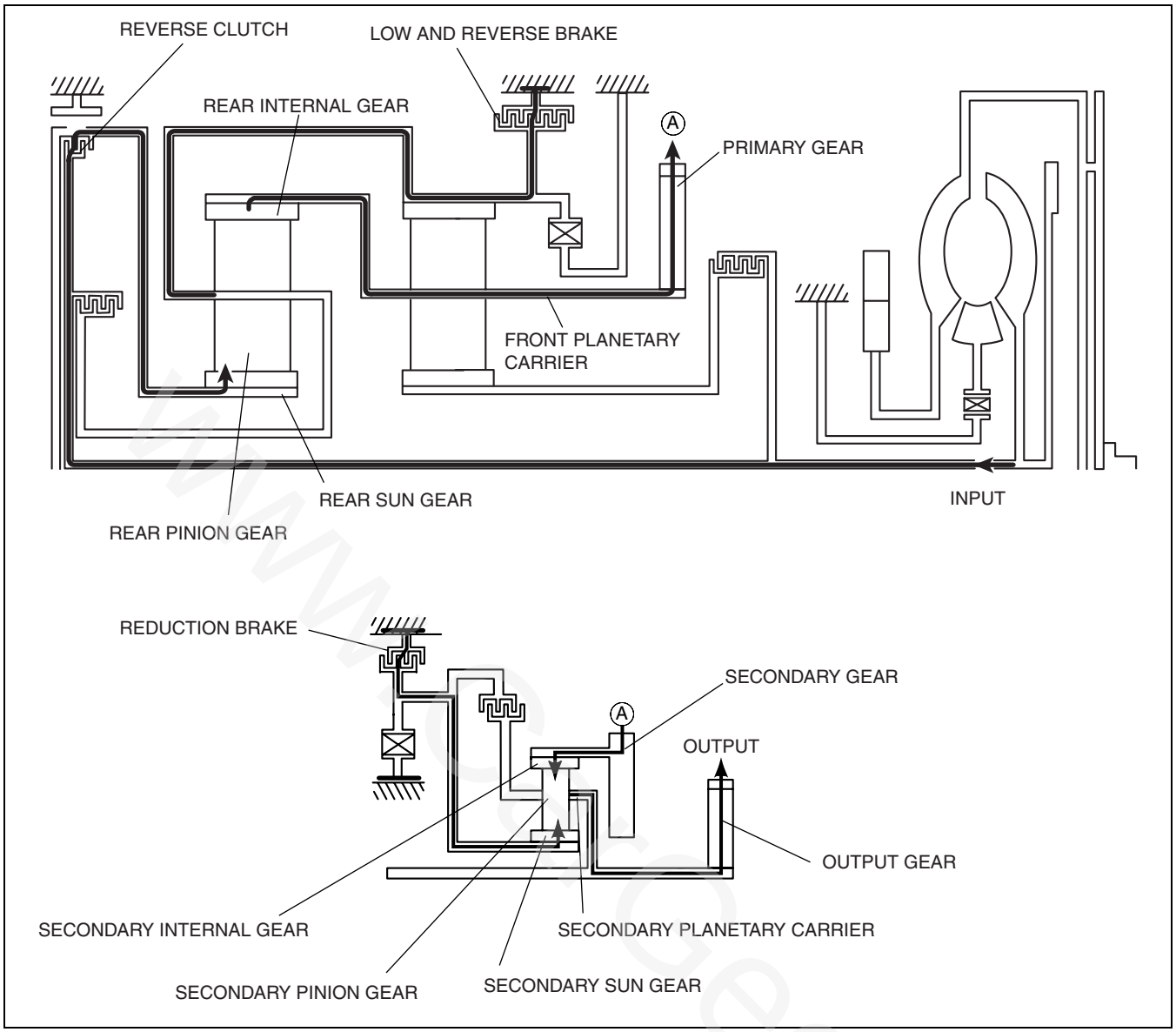


E6U517AS5016

R position



E6U517AS5017



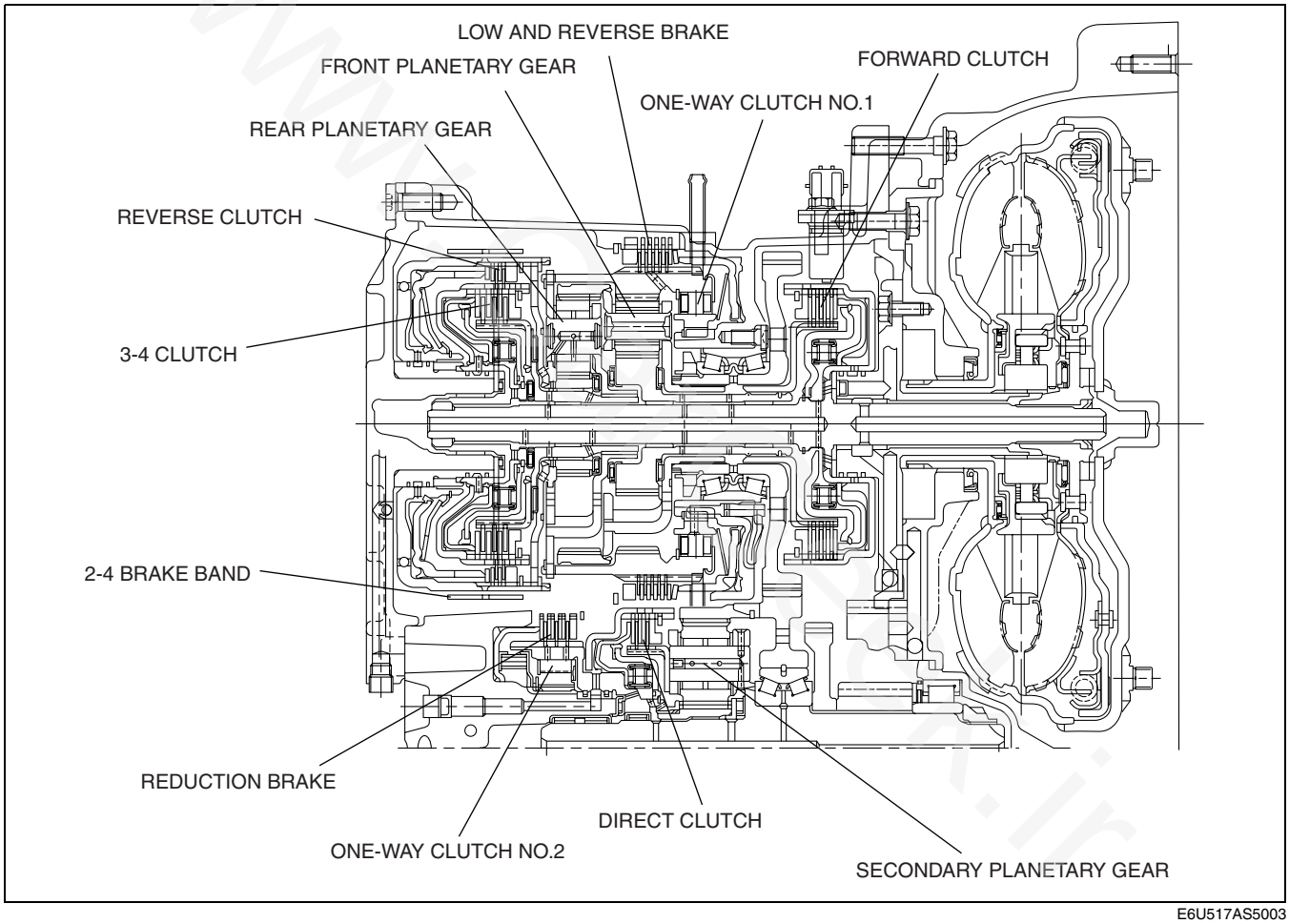
E6U517AS5018

FORWARD CLUTCH, 3-4 CLUTCH, REVERSE CLUTCH, DIRECT CLUTCH, LOW AND REVERSE BRAKE, REDUCTION BRAKE OUTLINE

E6U051719500A01

- Each multi-disc type clutch and brake has the following function and operates in the gear position(s) as shown in the figure.

Component	Function	Gear position
Forward clutch	• Transmits input torque from turbine shaft to front sun gear.	1GR, 2GR, 3GR
3-4 clutch	• Transmits input torque from turbine shaft to rear planetary carrier.	3GR, 4GR, 5GR
Reverse clutch	• Transmits input torque from turbine shaft to rear sun gear.	Reverse
Direct clutch	• Engage the secondary planetary carrier and the secondary sun gear.	5GR
Low and reverse brake	• Fixes rotation of front internal gear or rear planetary carrier.	Reverse, 1GR (M range)
Reduction brake	• Fixes rotation of secondary sun gear.	1GR, 2GR, 3GR, 4GR

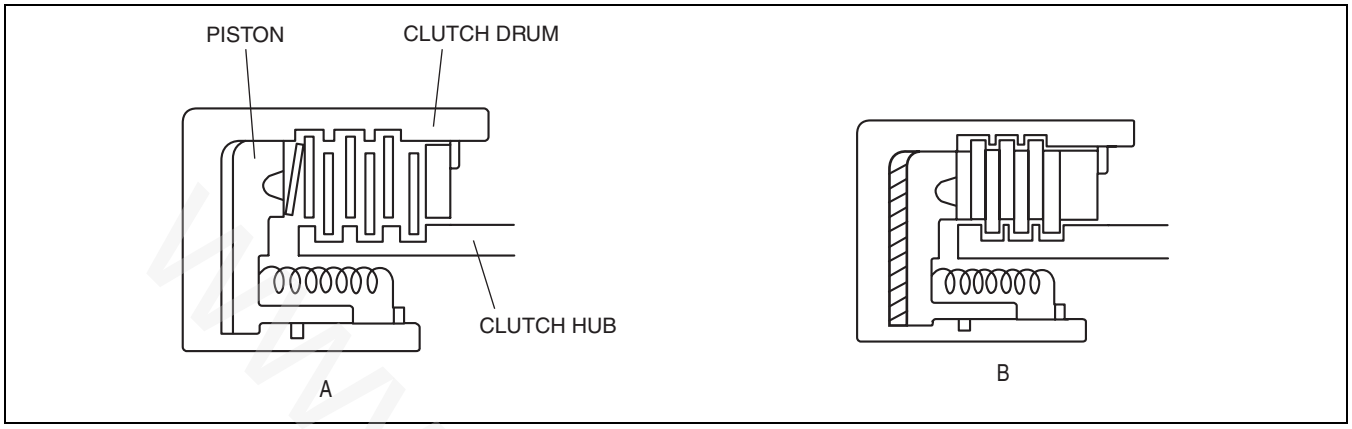


E6U517AS5003

FORWARD CLUTCH, 3-4 CLUTCH, REVERSE CLUTCH, DIRECT CLUTCH, LOW AND REVERSE BRAKE, REDUCTION BRAKE OPERATION

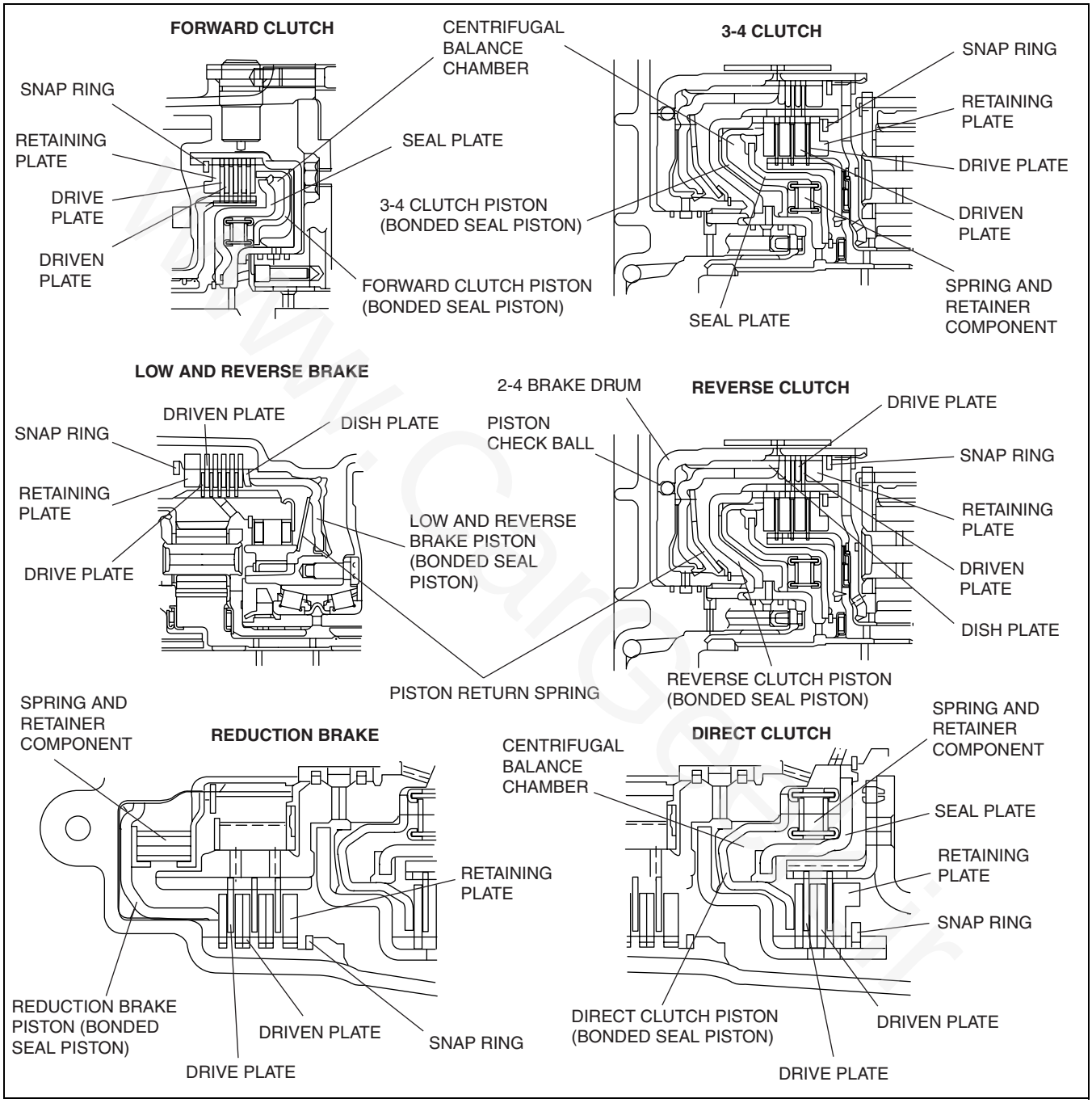
E6U051719500A02

- The basic structure is as shown in the figure below. In figure A, the fluid is in the clutch plates (drive plates, driven plates) and the power is not transmitted because of the fluid slippage on each plate. Figure B shows the clutch condition with the hydraulic pressure acted on the piston; the drive plates and the driven plates are pressed tightly together to transmit the clutch drum rotation speed to the hub. When the hydraulic pressure in the piston is drained, the clutches are separated because of the return spring and return to the condition in figure A.



E6U517YA6002

- The dished plates used for the reverse clutch and the low and reverse brake reduce the shock caused by the sudden clutch engagement. The piston check ball built in the 2-4 brake drum (reverse clutch) drains the ATF only during freewheel to prevent the hydraulic pressure from increasing to half-engage the clutches because of the residual ATF. In the forward clutch, the 3-4 clutch and the direct clutch, the centrifugal balance chamber is installed opposite the general clutch chamber. The centrifugal balance chamber of forward clutch, 3-4 clutch is always filled with the ATF from the exclusive lubrication passage of the turbine shaft. The centrifugal balance chamber of Direct clutch is always filled with the ATF from the exclusive lubrication passage of the counter shaft.



E6U517YA6003

CENTRIFUGAL BALANCE CLUTCH OUTLINE

E6U051719500A03

- A centrifugal balance clutch mechanism, which cancels the centrifugal oil pressure, has been adopted to improve clutch control.
- A bonded seal piston (press-worked component of a piston and a seal) has been adopted for each clutch and brake to reduce the piston size and weight.

CENTRIFUGAL BALANCE CLUTCH STRUCTURE

E6U051719500A04

- The centrifugal balance clutch chambers are installed opposite the clutch chamber. The centrifugal balance clutch chambers are constantly filled with ATF from an exclusive hydraulic passage of the turbine shaft.

CENTRIFUGAL BALANCE CLUTCH OPERATION

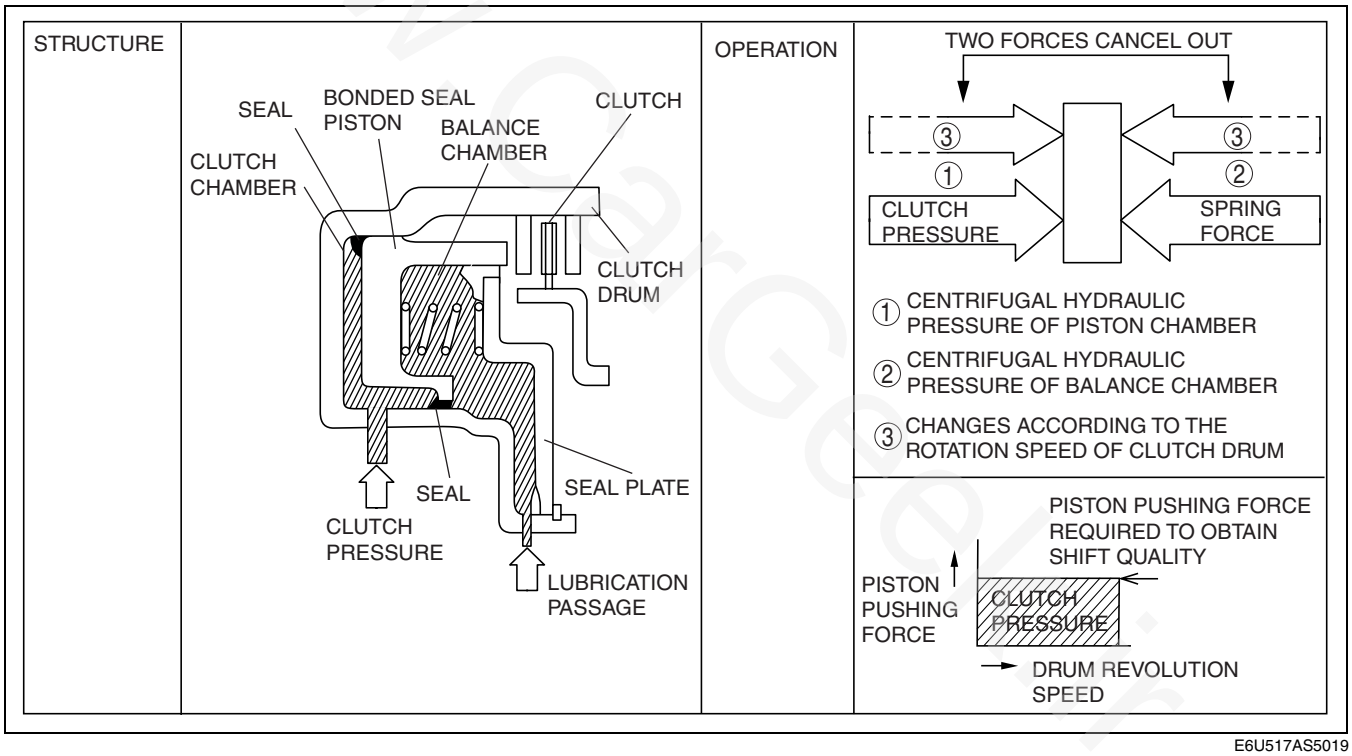
E6U051719500A05

When clutch pressure is not applied

- When the clutch drum rotates, centrifugal force acts on the residual ATF in the clutch chamber to push against the piston. However, centrifugal force also acts on the ATF filling the centrifugal balance clutch chamber to push back the piston. As a result, the two forces are cancelled out and the piston remains stationary, thus preventing clutch engagement.

When clutch pressure is applied

- When clutch pressure is applied to the clutch chamber, the clutch pressure overcomes the oil pressure and spring force in the opposite centrifugal balance clutch chamber, and pushes the piston to engage the clutches. Because the centrifugal force acting on the clutch pressure in the clutch chamber is canceled by another centrifugal force acting on the ATF filling the centrifugal balance clutch chamber, the influence of the centrifugal force created by the clutch drum revolution speed is eliminated. As a result, stable piston pushing force is obtained in all rotation ranges, and smoother shifts can be made.



E6U517AS5019

2-4 BRAKE BAND OUTLINE

E6U051719500A06

- The 2-4 brake band locks the 2-4 brake drum and fixes the rear sun gear. The 2-4 brake band operates in 2GR, 4GR or 5GR.

2-4 BRAKE BAND STRUCTURE

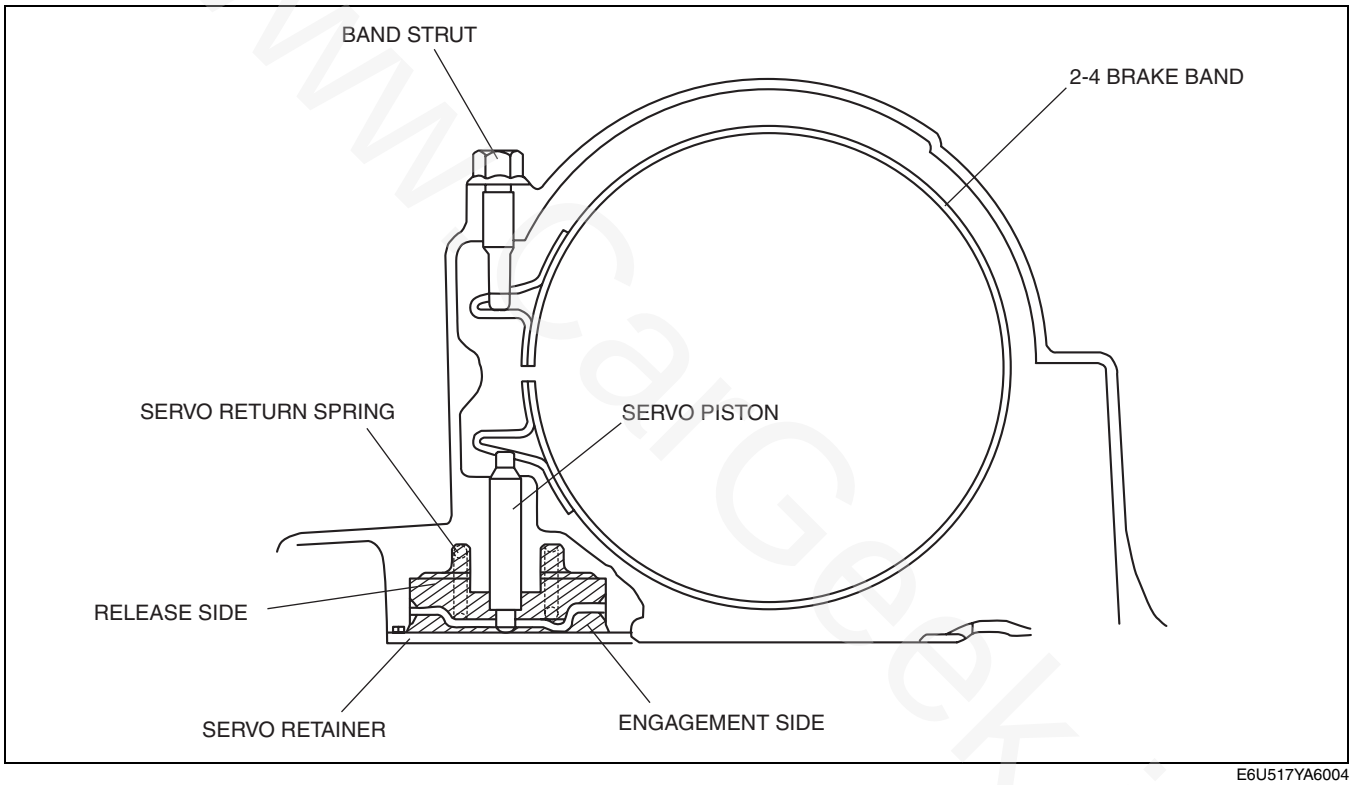
E6U051719500A07

- The 2-4 brake band is set to wind the 2-4 brake drum and one end of the 2-4 brake band is fixed with a band strut. The servo piston is in the transaxle case.

2-4 BRAKE BAND OPERATION

E6U051719500A08

- When the hydraulic pressure acts between the servo retainer and the servo piston (2-4 brake band engagement side), the servo piston acts on the 2-4 brake band to lock the 2-4 brake drum. At the same time, the servo return spring also works as resistance to obtain the optimal 2-4 brake band engagement force.
  When the hydraulic pressure acts between the servo piston and the transaxle case (2-4 brake band release side), the servo piston is pushed to the servo retainer side. This causes the 2-4 brake band to extend by its own spring force and unlock the 2-4 brake drum.
  When the hydraulic pressure acts between the servo retainer and the servo piston and between the servo piston and the transaxle case simultaneously, the servo piston is pushed to the servo retainer side and the 2-4 brake drum is unlocked because of the difference in the two areas and spring force.



E6U517YA6004

ONE-WAY CLUTCH OUTLINE

E6U051719500A09

One-Way Clutch No.1

- The one-way clutch No.1 locks the counterclockwise rotation (seen from the torque converter side) of the front internal gear. The one-way clutch No.1 operates in D, and M range of the 1GR.

One-Way Clutch No.2

- The one-way clutch No.2 locks the clockwise rotation (seen from the torque converter side) of the direct clutch drum. The one-way clutch No.2 operates in D, and M range of the 1GR, 2GR, 3GR and 4GR.

ONE-WAY CLUTCH STRUCTURE

E6U051719500A10

One-Way Clutch No.1

- The one-way clutch outer race is integrated with the front internal gear, and the one-way clutch inner race is fixed to the transaxle case.

One-Way Clutch No.2

- The one-way clutch outer race is integrated with the direct clutch drum, and the one-way clutch inner race is fixed to the transaxle case.

ONE-WAY CLUTCH OPERATION

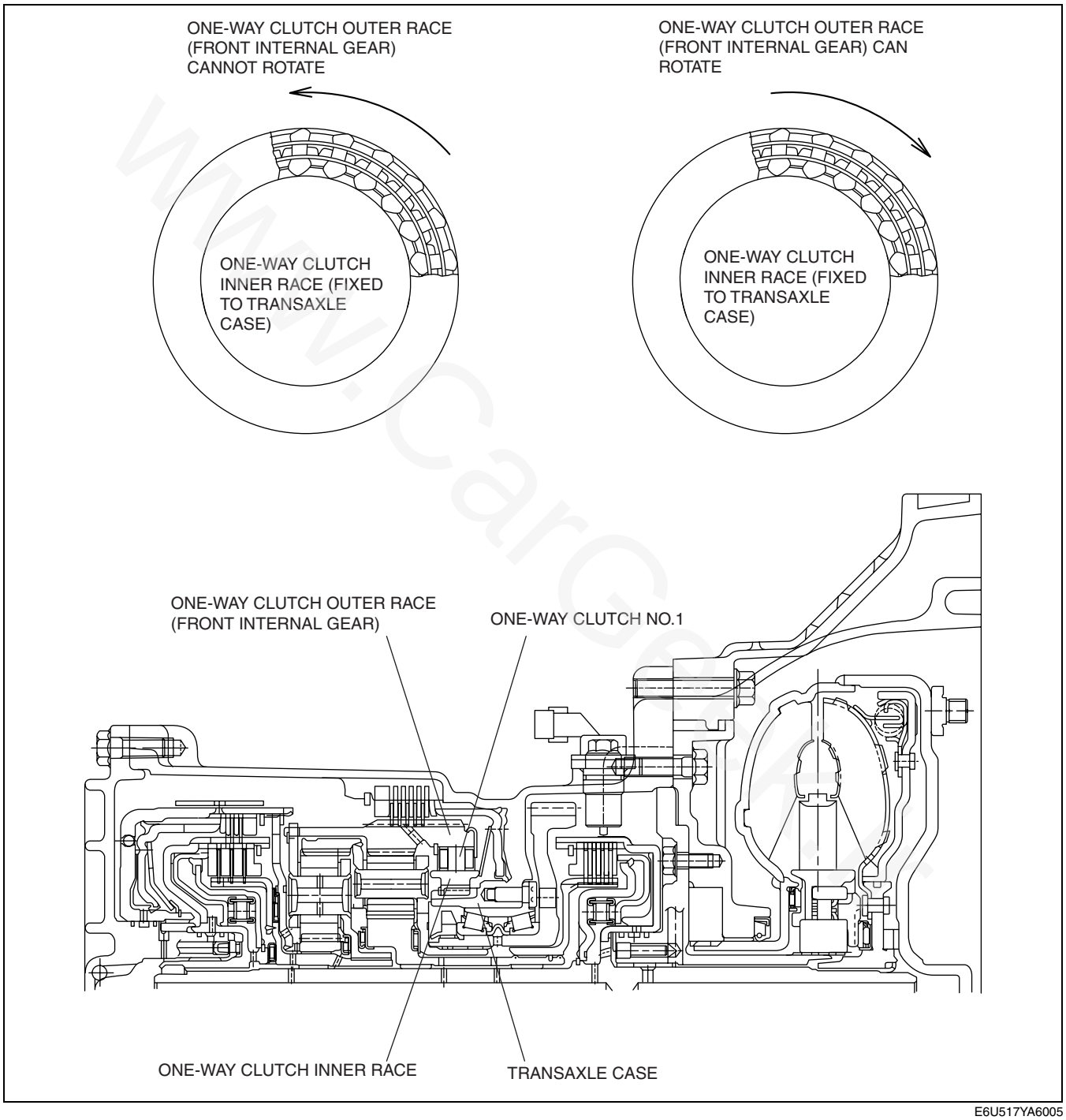
E6U051719500A11

One-Way Clutch No.1

- The one-way clutch outer race (front internal gear) rotates clockwise (seen from the torque converter side) freely, but the sprags rise to lock the rotation when the outer race tries to rotate counterclockwise.
- The one-way clutch No.1 locks the counterclockwise rotation of the front internal gear, and also locks the counterclockwise revolution of the rear planetary gear via the rear planetary carrier.

Note

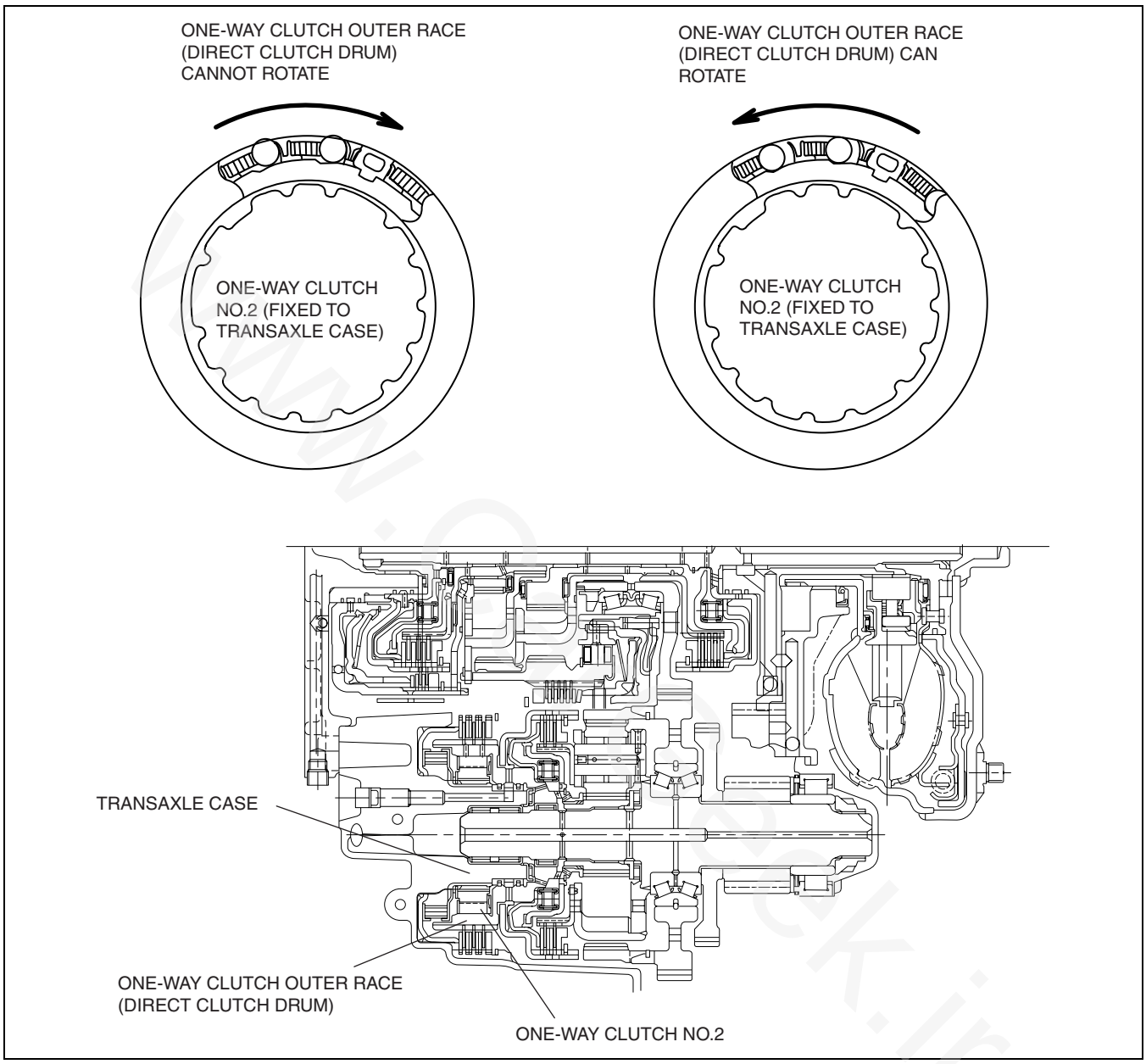
- All direction of rotation are viewed from the torque converter.



E6U517YA6005

One-Way Clutch No.2

- The one-way clutch outer race (direct clutch) rotates counterclockwise (view from torque converter) freely, however, the roller moves to the right (view from torque converter) and locks the rotation when it tries to rotate clockwise.
- One-way clutch No.2 locks the clockwise rotation of the direct clutch, and also locks the clockwise rotation of the secondary sun gear via the direct clutch.



E6U517YA6006

PLANETARY GEAR OUTLINE

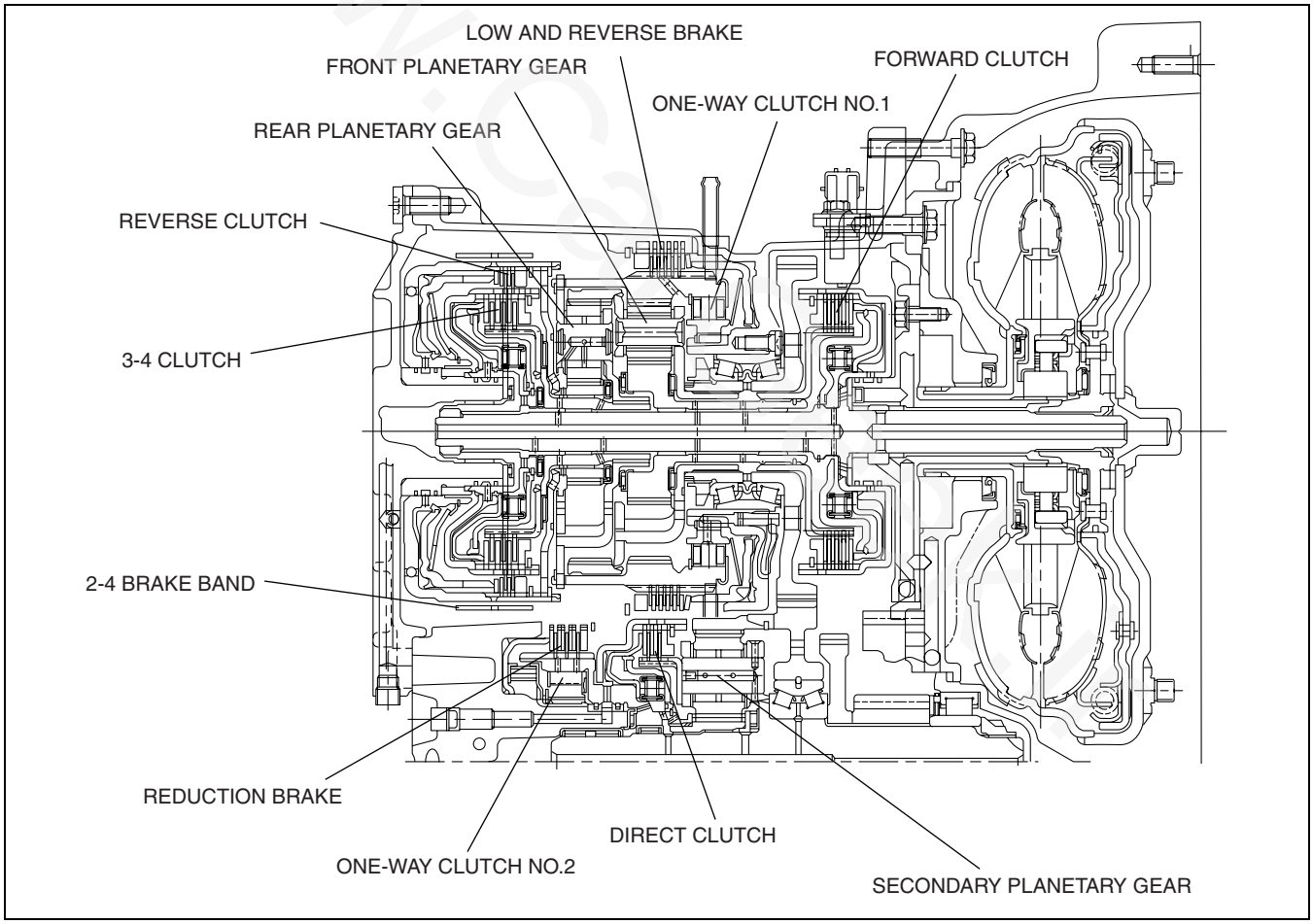
E6U051719540A01

- The planetary gear is a transaxle which converts the driving force of the turbine shaft to the optimal driving force and transmits it to the output gear through the operation of each clutch and brake.
- A double arranged gear with a single planetary gear unit is adopted as the main shifting mechanism for the planetary gear; they are the front planetary gear and the rear planetary gear (from converter side).
- A single planetary gear unit is adopted as the sub-shifting mechanism.
- The planetary gear consists of the internal gear, planetary carrier (pinion gears), and the sun gear.

PLANETARY GEAR STRUCTURE

E6U051719540A02

- The front planetary gear is integrated with the one-way clutch outer race and engaged with the drive plate of the low and reverse brake.
  Because of this, when the front planetary gear rotates, the one-way clutch outer race and the drive plate of the low and reverse brake also rotate together.
- The front sun gear is installed inside of the front pinion gears, and the front internal gear is installed outside of the front pinion gears. The front sun gear is engaged with the forward clutch hub, and the front internal gear is engaged with the rear planetary carrier.
- The rear planetary gear and the rear pinion gear have the rear sun gear installed inside and the rear internal gear outside. The rear sun gear is engaged with the turbine shaft via the 2-4 brake drum, and the rear internal gear is engaged with the primary gear via the front planetary carrier.
- For the secondary planetary gear, the secondary sun gear is built inside the secondary pinion gear, and the secondary internal gear is built externally. The secondary sun gear is connected to the direct clutch drum, and the secondary gear is connected to the secondary internal gear. The secondary planetary carrier is combined with the counter shaft, and also connected with the drive plate of the clutch.

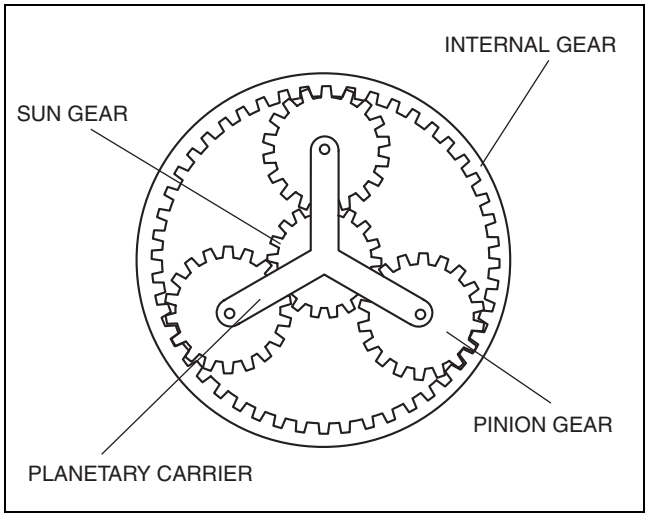


E6U517AS5003

PLANETARY GEAR OPERATION

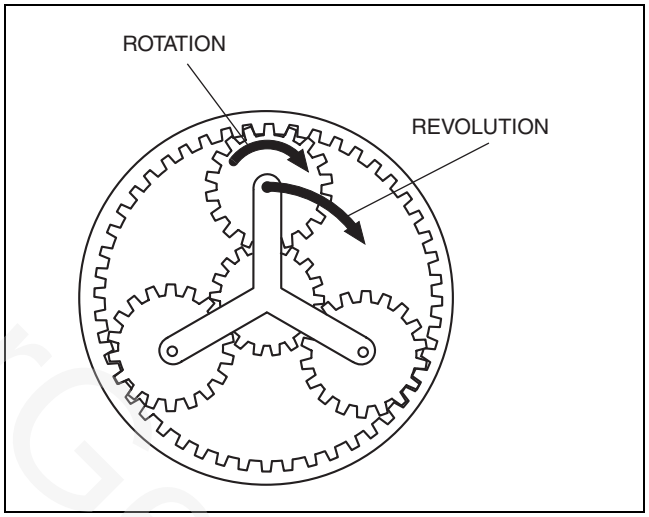
E6U051719540A03

- The planetary gear works as a transaxle when the sun gear and the internal gear are engaged.
- The sun gear, installed inside of the pinion gears, and the internal gear, installed outside of the pinion gears, are engaged with their respective gears.The sun gear and the internal gear rotate on the center of the planetary gear.



E6U517YA6007

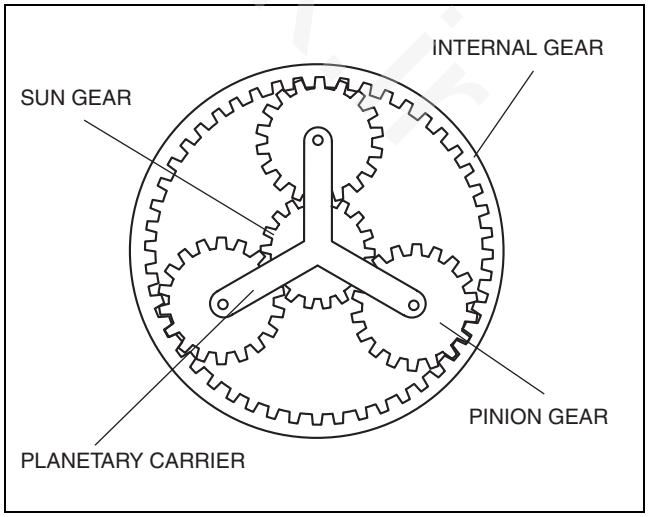
- The pinion gears turn in the following two ways:
  - — On their own centers (rotation)
  - — On the center of the planetary gear (revolution)



E6U517YA6008

Gear ratio of each range

- The relation between each element of the planetary gear set and the rotation speed is generally indicated in the formula below.
  $(Z_R+Z_S)\ N_C=Z_RN_R+Z_SN_S$: formula (1)
  In this formula Z stands for the number of teeth, N stands for the rotation speed, and R, S, C stand for each gear element (refer to the table below).

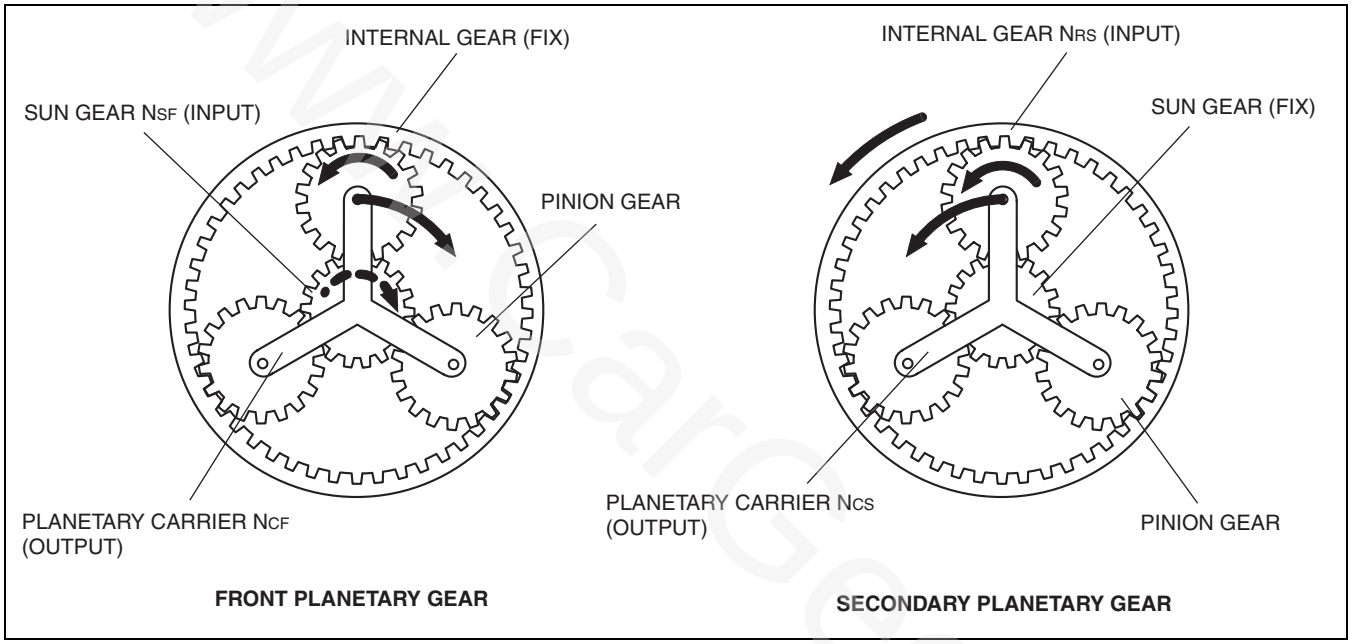


E6U517YA6009

Number of teeth and symbol of each gear

Planetary gear unit	Planetary gear element	Number of teeth	Unit identification symbol	
			Gear element	Unit
Front	Internal gear	89	R	F
	Planetary carrier (part of pinion gear)	20	C	F
	Sun gear	49	S	F
Rear	Internal gear	98	R	R
	Planetary carrier (part of pinion gear)	30	C	R
	Sun gear	37	S	R
Secondary	Internal gear	89	R	S
	Planetary carrier (part of pinion gear)	29	C	S
	Sun gear	31	S	S

First gear



E6U517YA6010

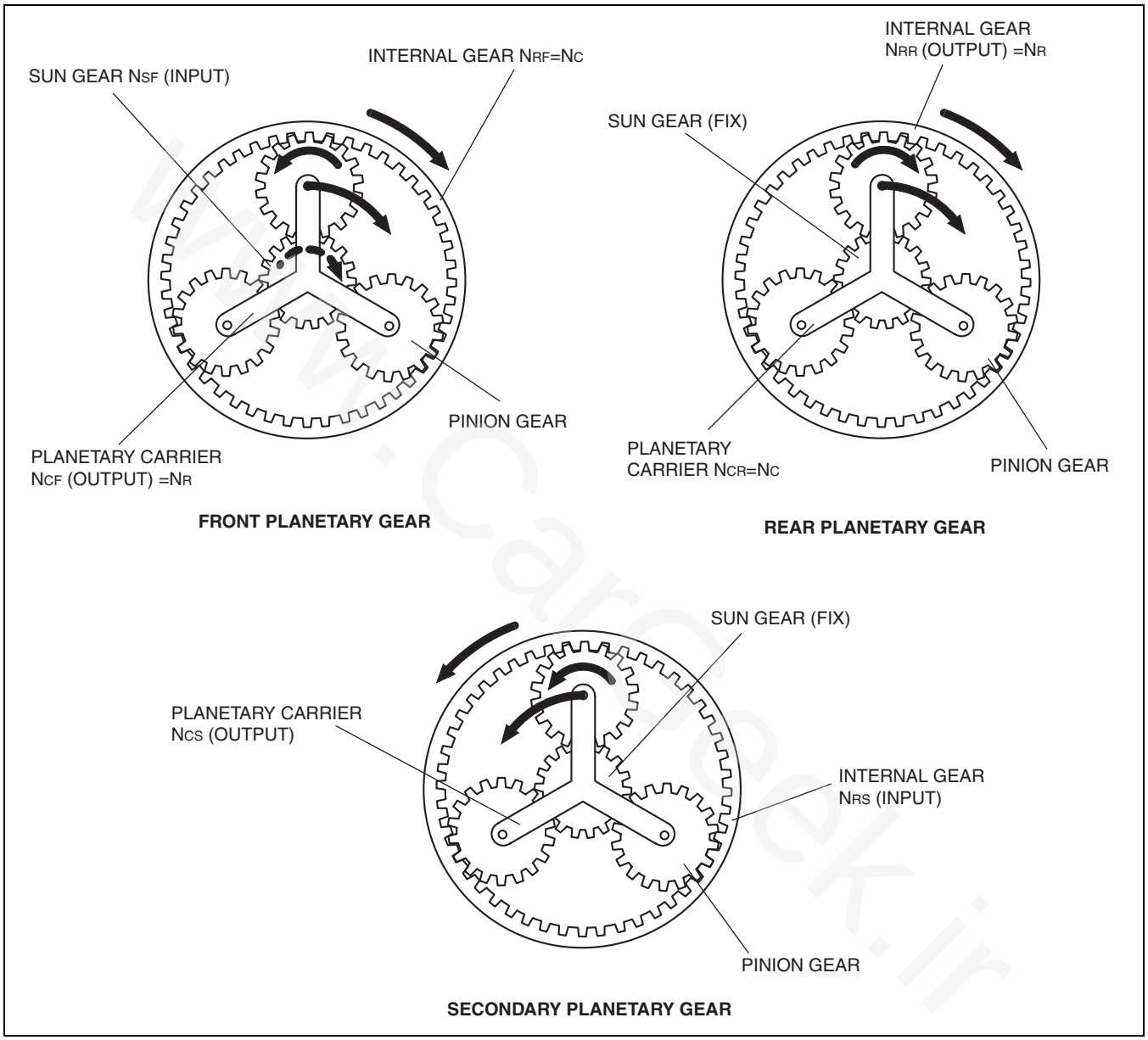
Gear rotation speed

Planetary gear unit	Front	Secondary
Internal gear	0 (fix)	N_{RS} (input)
Planetary carrier	N_{CF} (output)	N_{CS} (output)
Sun gear	N_{SF} (input)	0 (fix)

- Suppose the reduction ratio on the main shifting side is i_1,
  $i_1=N_{SF}/N_{CF}$.
- From the result $N_{RF}=0$ in formula (1), the rotation speed of the front planetary gear unit can be calculated using the following formula:
  $(Z_{RF}+Z_{SF})N_{CF}=Z_{SF}N_{SF}$
  Therefore,
  $i_1=N_{SF}/N_{CF}=(Z_{RF}+Z_{SF})/Z_{SF}=(89+49)/49=2.8163$.
- Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:
  The reduction ratio of the primary/secondary gear A = the number of primary gear teeth/the number of secondary gear teeth
  Therefore,
  A=82/86=0.9535
- Suppose the reduction ratio on the sub-shifting side is ii_1,
  $ii_1=N_{RS}/N_{CS}$.

- From the result N_{SS}=0 in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula.
  $(Z_{RS}+Z_{SS})N_{CS}=Z_{SS}N_{RS}$
  Therefore,
  $ii_1=N_{RS}/N_{CS}=(Z_{RS}+Z_{SS})/Z_{RS}=(89+31)/89=1.3483$
  And the reduction ratio of 1st gear= i_1 x A x ii_1=2.8163 x 0.9535 x 1.3483=3.620
  As a result, the reduction ratio of 1st gear is 3.620.

Second gear



E6U517YA6011

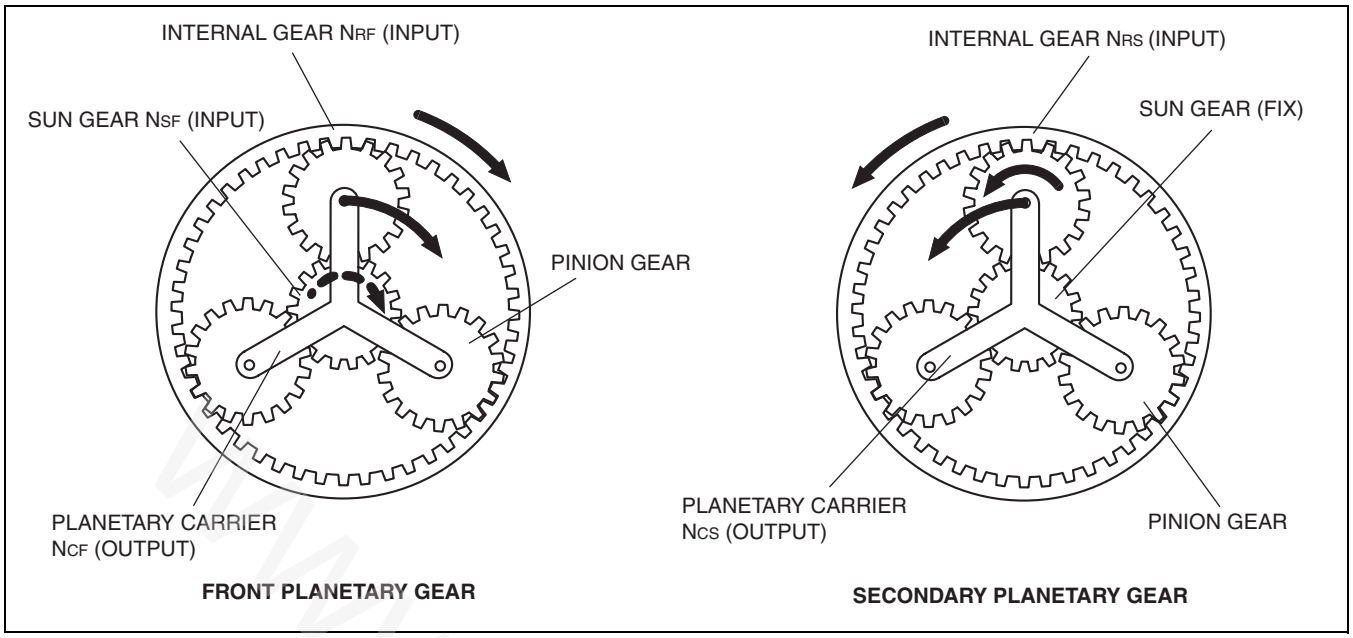
Gear rotation speed

Planetary gear	Front	Rear	Secondary
Internal gear	$N_{RF}=N_C$	N_{RR} (output) $=N_R$	N_{RS} (input)
Planetary carrier	N_{CF} (output) $=N_R$	$N_{CR}=N_C$	N_{CS} (output)
Sun gear	N_{SF} (input)	0 (fix)	0 (fix)

Note
- The front internal gear and the rear planetary carrier are integrated.
- The front planetary carrier and the rear internal gear rotate at the same speed.

- Suppose the reduction ratio on the main shifting side is i_2,
  $i_2=N_{SF}/N_R$.
- From formula (1), the relation between the gear ratio in second gear and the rotation speeds of the front and the rear planetary gar sets is indicated in formulas (2) and (3).
  $(Z_{RF}+Z_{SF})\ N_R=Z_{RF}N_C+Z_{SF}N_{SF}$: (2) (Front planetary gear set)
  $(Z_{RR}+Z_{SR})\ N_C=Z_{RR}N_R+Z_{SR}N_{SF}$: (3) (Rear planetary gear set)
- From the result $N_{SR}=0$ in formula (3).
  $N_C=(Z_{RR}/(Z_{RR}+Z_{SR}))\ N_R$: (4)
- Here we substitute formula (4) in formula (2).
  $Z_{SR}N_{SF}=(((Z_{RR}+Z_{SR})(Z_{RF}+Z_{SF})-Z_{RF}Z_{RR})/(Z_{RR}+Z_{SR}))\ N_R$
  Therefore,
  $i_2=N_{SF}/N_R=(((Z_{RR}+Z_{SR})(Z_{RF}+Z_{SF})-Z_{RF}Z_{RR})/(Z_{SF}(Z_{RR}+Z_{SR})))\ N_R$
  $=((98+37)(89+49)-89\times 98)/(49(98+37))=1.4978$
- Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:
  The reduction ratio of the primary/secondary gear A = the number of primary gear teeth/the number of secondary gear teeth
  Therefore,
  A=82/86=0.9535
- Suppose the reduction ratio on the sub-shifting side is ii_2,
  $ii_2=N_{RS}/N_{CS}$.
- From the result $N_{SS}=0$ in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula.
  $(Z_{RS}+Z_{SS})N_{CS}=Z_{SS}N_{RS}$
  Therefore,
  $ii_2=N_{RS}/N_{CS}=(Z_{RS}+Z_{SS})/Z_{RS}=(89+31)/89=1.3483$
  And the reduction ratio of 2nd gear= $i_2 \times A \times ii_2=1.4978 \times 0.9535 \times 1.3483=1.925$
  As a result, the reduction ratio of 2nd gear is 1.925.

Third gear



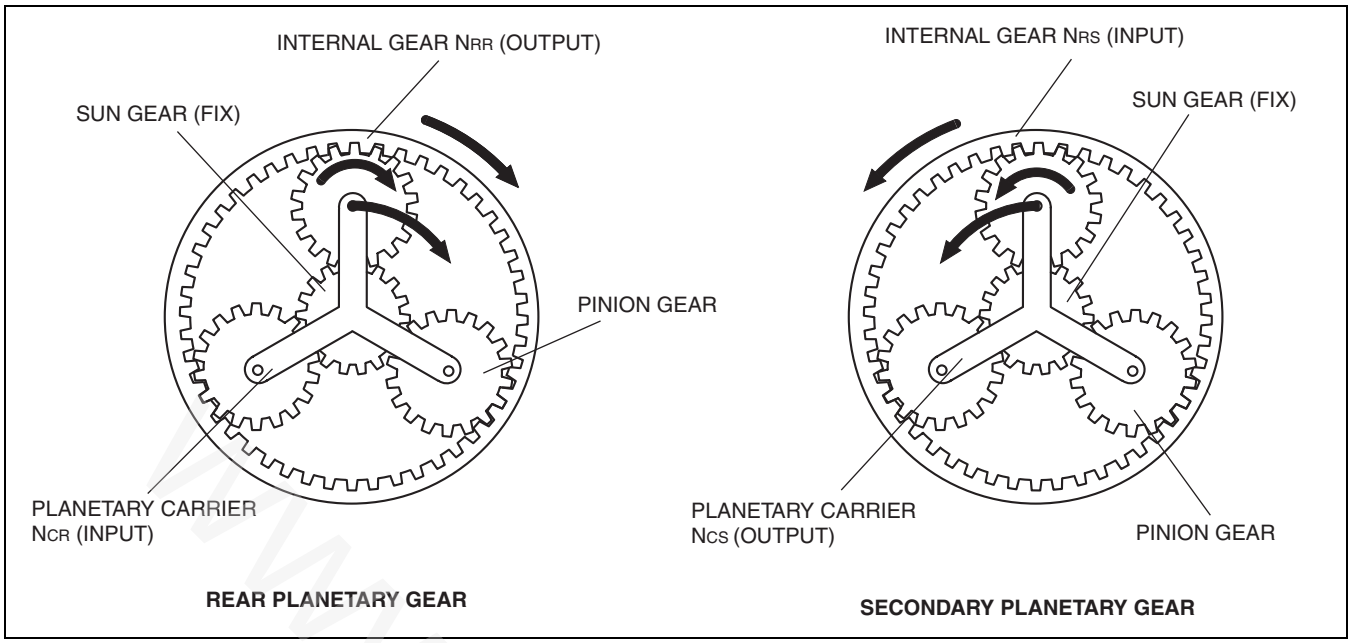
E6U517YA6012

Gear rotation speed

Planetary gear	Front	Secondary
Internal gear	N_{RF} (input)	N_{RS} (input)
Planetary carrier	N_{CF} (output)	N_{CS} (output)
Sun gear	N_{SF} (input)	0 (fix)

- Here we have the result on $N_{RF}=N_{SF}$.
- Suppose the reduction ratio on the main shifting side is i_3,
  $i_3=N_{SF}/N_{CF}$.
- From the result of $N_{RF}=N_{SF}$ in formula (1), the relation between the gear ratio in 3rd gear and the rotation speed of the front planetary gar set is indicated in the following formula:
  $(N_{RF}+Z_{SF})\ N_{CF}= (Z_{RF}+Z_{SF})\ N_{RF}$
  Therefore,
  $i_3=N_{RF}/N_{CF}= (Z_{RF}+Z_{SF}) / (Z_{RF}+Z_{SF}) = (89+49) / (89+49) =1.000$
- Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:
  The reduction ratio of the primary/secondary gear A = the number of primary gear teeth/the number of secondary gear teeth
  Therefore,
  A=82/86=0.9535
- Suppose the reduction ratio on the sub-shifting side is ii_3,
  $ii_3=N_{RS}/N_{CS}$.
- From the result $N_{SS}=0$ in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula.
  $(Z_{RS}+Z_{SS})N_{CS}=Z_{SS}N_{RS}$
  Therefore,
  $ii_3=N_{RS}/N_{CS}=(Z_{RS}+Z_{SS})/Z_{RS}=(89+31)/89=1.3483$
  And the reduction ratio of 3rd gear= i_3 x A x ii_3=1.000 x 0.9535 x 1.3483=1.285
  As a result, the reduction ratio of 3rd gear is 1.285.

Fourth gear



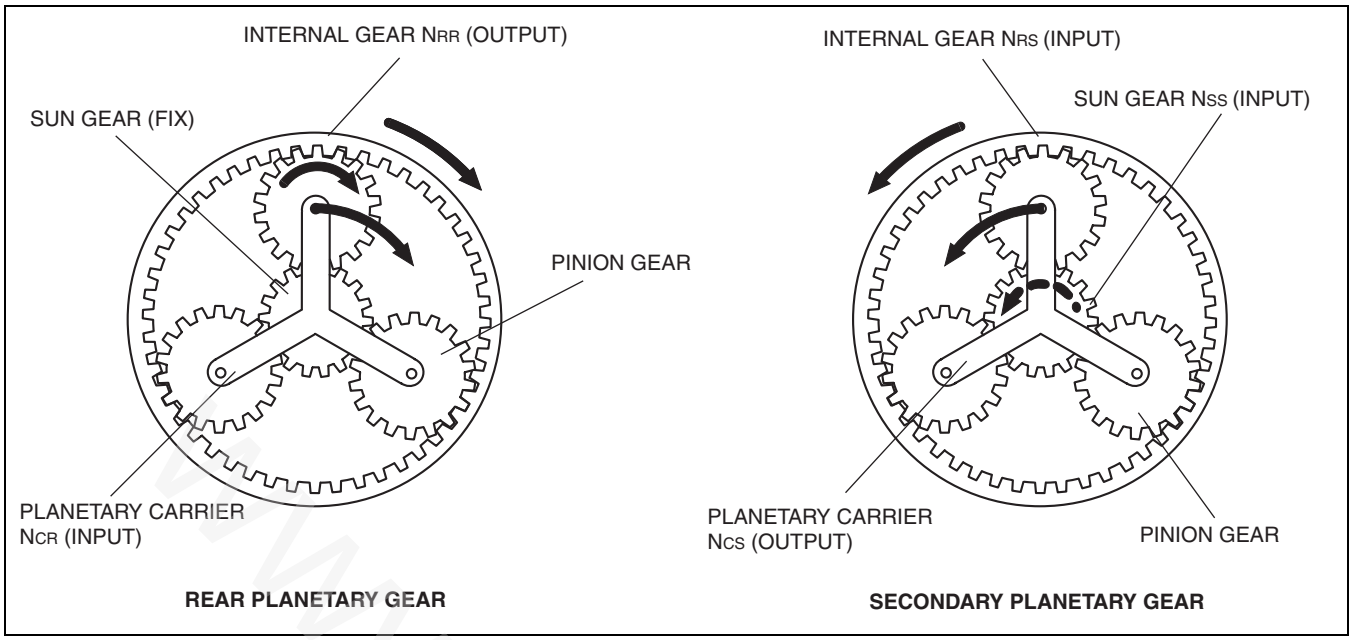
E6U517YA6013

Gear rotation speed

Planetary gear	Rear	Secondary
Internal gear	N_{RR} (output)	N_{RS} (input)
Planetary carrier	N_{CR} (input)	N_{CS} (output)
Sun gear	0 (fix)	0 (fix)

- Suppose gear ratio in fourth gear is i_4,
  $i_4=N_{CR}/N_{RR}$
- From the result of $N_{SR}=0$ in formula (2), the relation between the gear ratio in fourth gear and the rotation speed of the rear planetary gear set is indicated in the following formula:
  $(Z_{RR}+Z_{SR})\ N_{CR}=Z_{RR}N_{RR}$
  Therefore,
  $i_4=N_{CR}/N_{RR}=Z_{RR}/\ (Z_{RR}+Z_{SR})$ =98/ (98+37) =0.7259
- Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:
  The reduction ratio of the primary/secondary gear A = the number of primary gear teeth/the number of secondary gear teeth
  Therefore,
  A=82/86=0.9535
- Suppose the reduction ratio on the sub-shifting side is ii_4,
  $ii_4=N_{RS}/N_{CS}$.
- From the result $N_{SS}=0$ in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula.
  $(Z_{RS}+Z_{SS})N_{CS}=Z_{SS}N_{RS}$
  Therefore,
  $ii_4=N_{RS}/N_{CS}=(Z_{RS}+Z_{SS})/Z_{RS}$=(89+31)/89=1.3483
  And the reduction ratio of 4th gear= i_4 x A x ii_4=0.7259 x 0.9535 x 1.3483=0.933
  As a result, the reduction ratio of 4th gear is 0.933.

Fifth gear



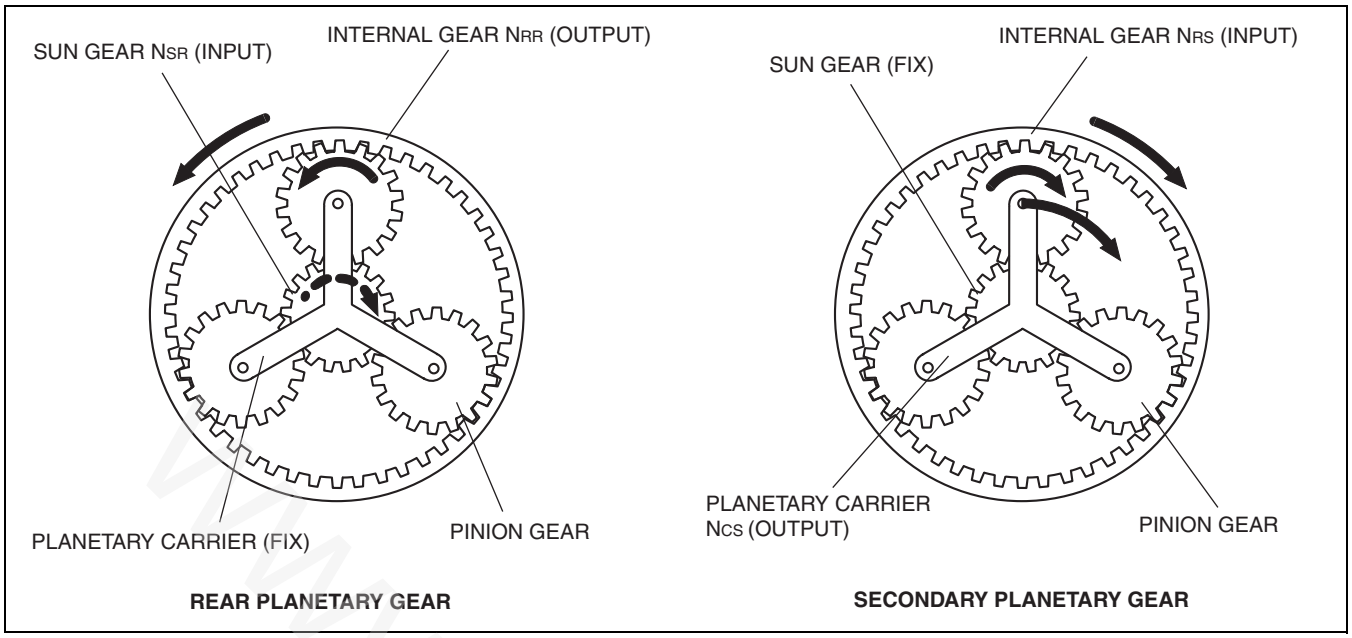
E6U517YA6014

Gear rotation speed

Planetary gear	Rear	Secondary
Internal gear	N_{RR} (output)	N_{RS} (input)
Planetary carrier	N_{CR} (input)	N_{CS} (output)
Sun gear	0 (fix)	N_{SS} (input)

- Suppose gear ratio in fifth gear is i_5,
  $i_5=N_{CR}/N_{RR}$
- From the result of $N_{SR}=0$ in formula (2), the relation between the gear ratio in fourth gear and the rotation speed of the rear planetary gear set is indicated in the following formula:
  $(Z_{RR}+Z_{SR})\ N_{CR}=Z_{RR}N_{RR}$
  Therefore,
  $i_5=N_{CR}/N_{RR}=Z_{RR}/\ (Z_{RR}+Z_{SR})$ =98/ (98+37) =0.7259
- Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:
  The reduction ratio of the primary/secondary gear A = the number of primary gear teeth/the number of secondary gear teeth
  Therefore,
  A=82/86=0.9535
- Suppose the reduction ratio on the sub-shifting side is ii_5,
  $ii_5=N_{RS}/N_{CS}$.
- From the result $N_{RS}= N_{SS}$ in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula.
  $(Z_{RS}+Z_{SS})N_{CS}=(Z_{RS}Z_{SS})N_{RS}$
  Therefore,
  $ii_5=N_{RS}/N_{CS}=(Z_{RS}+Z_{SS})/(Z_{RS}+Z_{SS})=(89+31)/(89+31)=1.000$
  And the reduction ratio of 5th gear= i_5 x A x ii_5=0.7259 x 0.9535 x 1.000=0.692
  As a result, the reduction ratio of 5th gear is 0.692.

Reverse



E6U517YA6015

Gear rotation speed

Planetary gear	Rear	Secondary
Internal gear	N_{RR} (output)	N_{RS} (input)
Planetary carrier	0 (fix)	N_{CS} (output)
Sun gear	N_{SR} (input)	0 (fix)

- Suppose gear ratio in reverse gear is i_{REV},
  $i_{REV}=N_{SR}/N_{RR}$
- From the result of $N_{CR}=0$ in formula (2), the relation between the gear ratio during reverse movement and the rotation speed of the planetary gar set is indicated in the formula below.
  $(Z_{RR}+Z_{SR})\ 0=Z_{RR}N_{RR}+Z_{SR}N_{SR}$
  Therefore,
  $i_{REV}=N_{SR}/N_{RR}=Z_{RR}/Z_{SR}=-98/37=-2.6486$
- Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:
  The reduction ratio of the primary/secondary gear A = the number of primary gear teeth/the number of secondary gear teeth
  Therefore,
  A=82/86=0.9535
- Suppose the reduction ratio on the sub-shifting side is ii_{REV},
  $ii_{REV}=N_{RS}/N_{CS}$.
- From the result $N_{SS}=0$ in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula.
  $(Z_{RS}+Z_{SS})N_{CS}=Z_{SS}N_{RS}$
  Therefore,
  $ii_{REV}=N_{RS}/N_{CS}=(Z_{RS}+Z_{SS})/Z_{RS}=(89+31)/89=1.3483$
  And the reduction ratio of reverse gear= i_{REV} x A x ii_{REV}=–2.6486 x 0.9535 x 1.3483=–3.405
  As a result, the reduction ratio of reverse gear is –3.405.

PARKING MECHANISM OUTLINE

E6U051721400A01

- When the selector lever is shifted to P position, the parking pawl engages the parking gear and locks the output gear (i.e., rotation of the driving wheels).

PARKING MECHANISM STRUCTURE

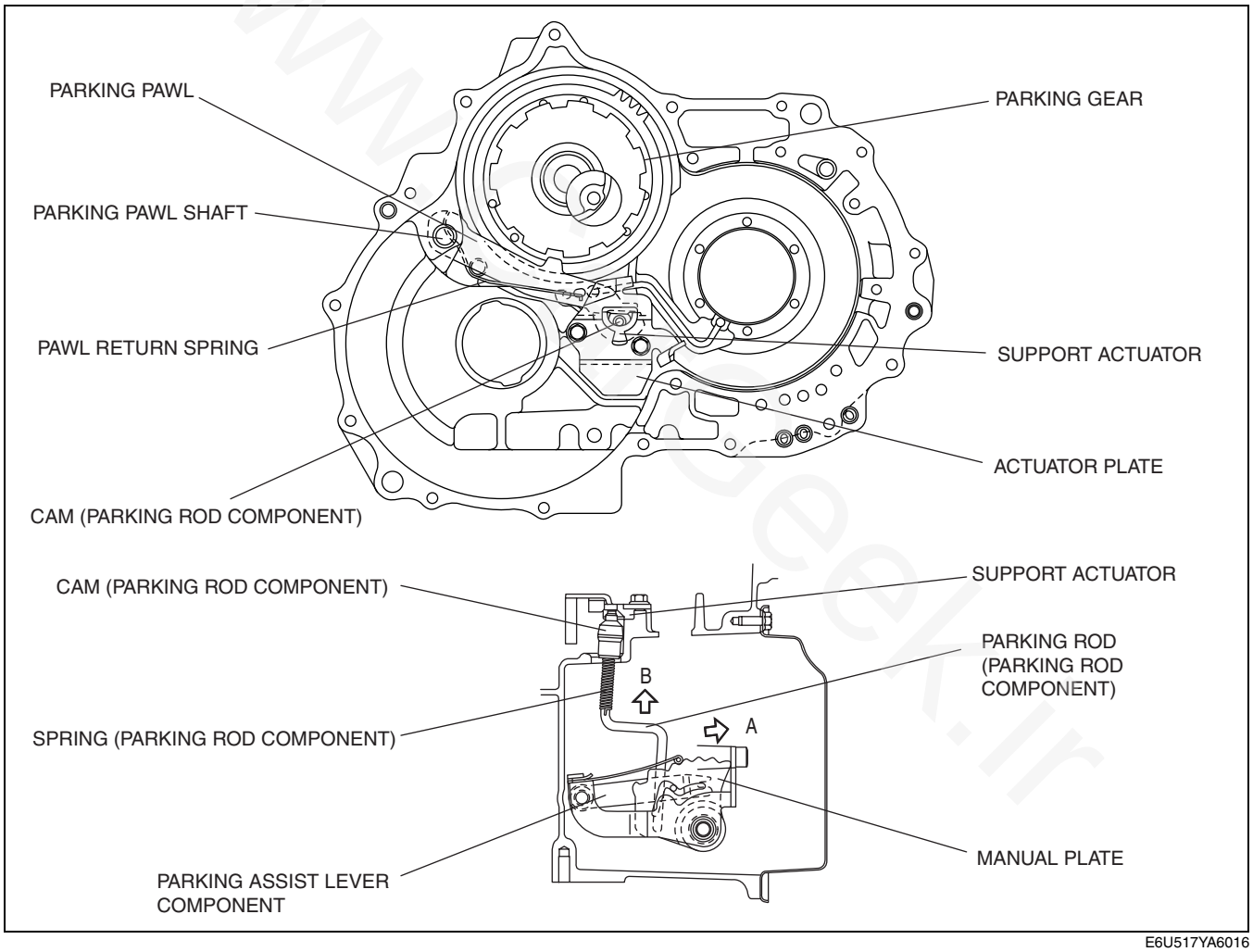
E6U051721400A02

- The parking pawl is installed in the transaxle case via the parking pawl shaft and pushed to the support actuator by the return spring except in P position.
  The parking rod component is designed to slide on the support actuator and connected to the manual plate.

PARKING MECHANISM OPERATION

E6U051721400A03

- When the selector lever is moved to P position, the manual shaft and the manual plate move in the direction of the arrow A to the position as shown in the figure below. Then the parking rod component moves in the direction of the arrow B, the parking rod component cam pushes up the parking pawl, and the parking pawl engages the parking gear.
  If the parking pawl hits the tooth of the parking gear, the parking pawl cannot be pushed up, so only the parking rod component is able to move. The cam presses the spring onto the parking pawl and the actuator. If the vehicle runs even a little under this condition, the wheels rotate and parking gear also rotates slightly. As a result, the parking pawl slides into the groove, and engages the parking gear.
  Thus, the parking mechanism prevents the vehicle from moving in P position.

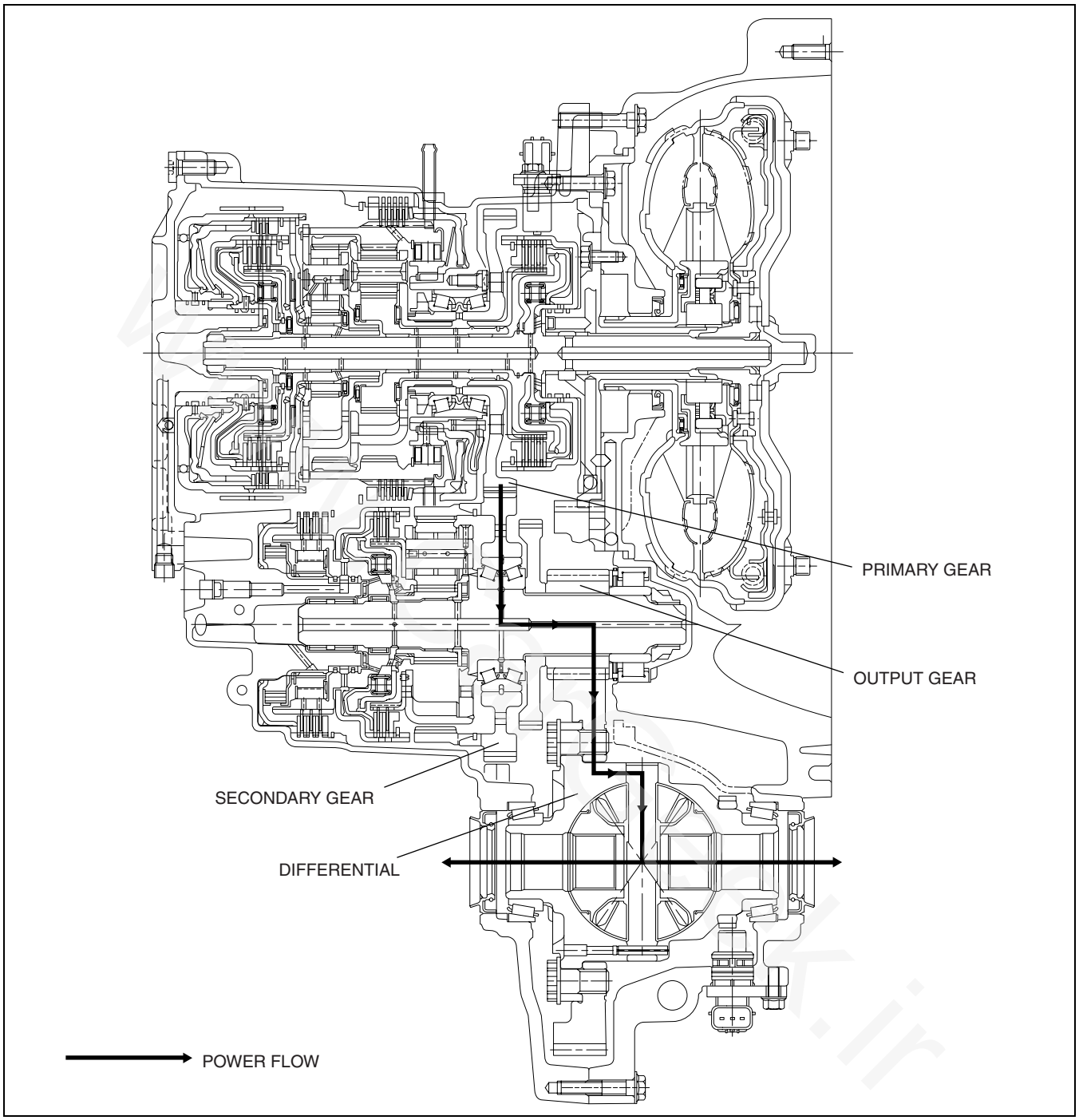


E6U517YA6016

OUTPUT GEAR OUTLINE

E6U051719204A01

- The two-step final drive mechanism has been adopted by arranging the secondary gear and the output gear on the output gear shaft to miniaturize the transaxle.

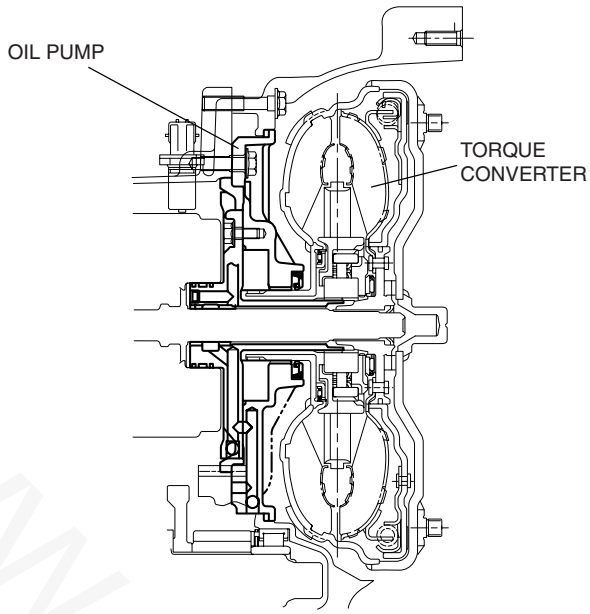


E6U517AS5020

OIL PUMP OUTLINE

E6U051719220A01

- The light-weight, compact, and quiet trochoid gear type oil pump has been adopted to reduce the pump driving torque.
- The direct drive type oil pump has been adopted and placed behind the torque converter.

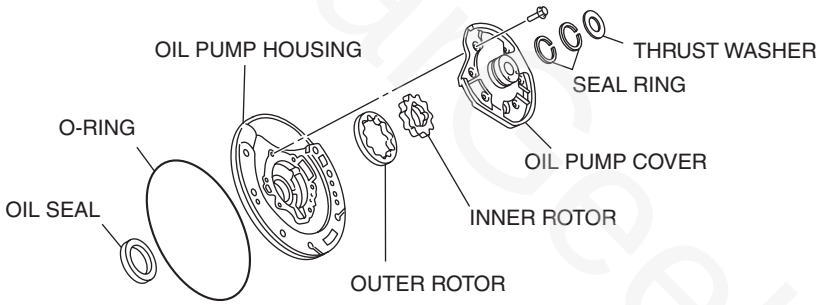


E6U517AS5022

OIL PUMP STRUCTURE

E6U051719220A02

- The outer rotor and the inner rotor are installed in the oil pump housing.
- The inner rotor in the oil pump housing is driven by the torque converter.

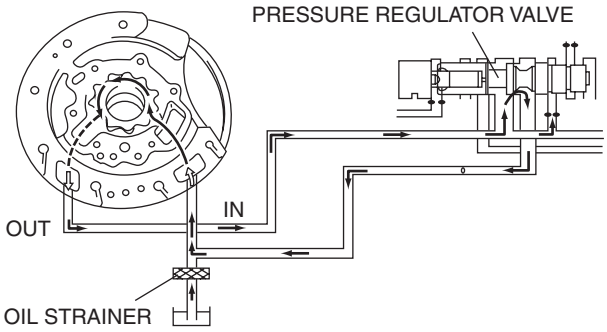


E6U517AS5023

OIL PUMP OPERATION

E6U051719220A03

- When the inner rotor in the oil pump rotates, the ATF is drawn to the oil pump and then discharged from the oil pump. The discharge amount is proportional to the rotating speed of the torque converter. The ATF discharge amount is controlled by the pressure regulator valve and the pressure control solenoid.

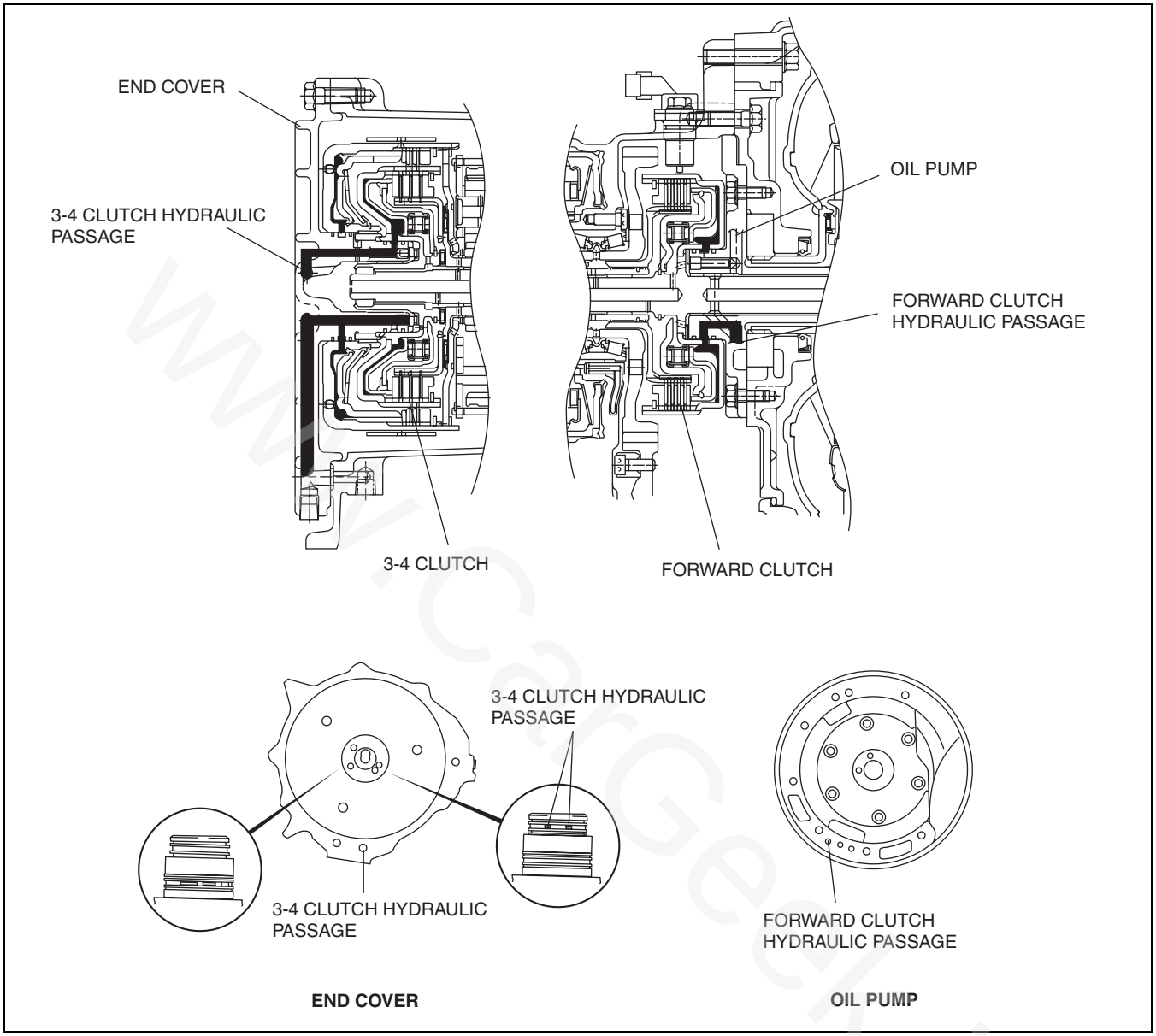


E6U517AS5024

FORWARD CLUTCH, 3-4 CLUTCH HYDRAULIC CIRCUIT OUTLINE

E6U051719500A12

- By designing exclusive passages for the forward clutch and the 3-4 clutch in the transaxle case, via the oil pump and end cover the hydraulic pressure passages are shortened and control during clutch engagement is improved.



E6U517YA6017

CONTROL VALVE BODY OUTLINE

E6U051721100A01

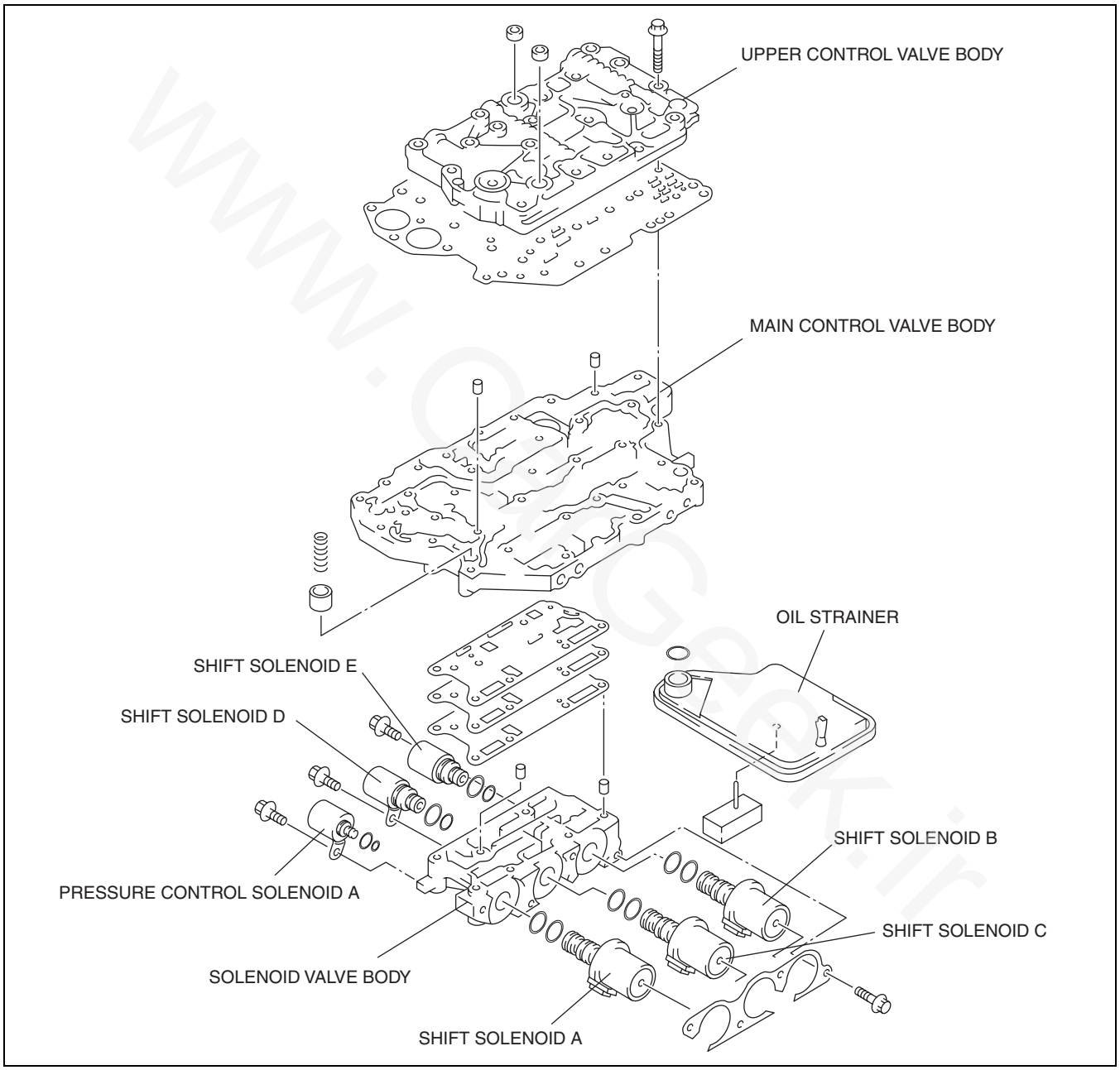
- The primary control valve body has been adopted as the main shifting mechanism.
- The secondary control valve body has been adopted as the sub-shifting mechanism.
- Because the clutch engagement pressure is controlled electronically, the hydraulic circuits are simplified, the valve types are reduced, and the control valve body is miniaturized.
- The nonwoven fabric oil strainer is installed in the primary control valve body to prevent contamination.

CONTROL VALVE BODY CONSTRUCTION

E6U051721100A02

Primary Control Valve Body

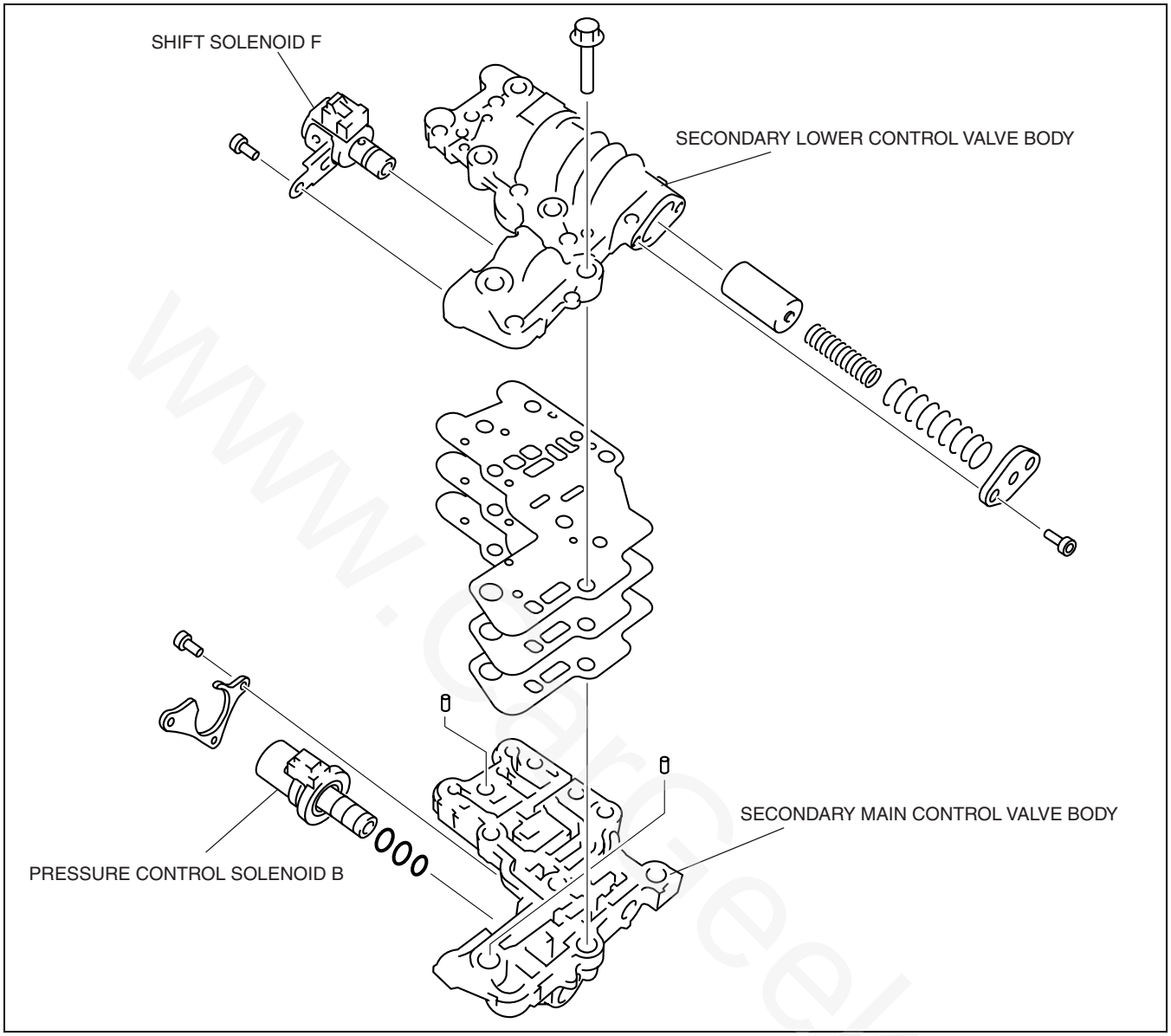
- The primary control valve body is composed of three bodies: the upper control valve body, main control valve body, and the solenoid control valve body.



E6U517AS5025

Secondary Control Valve Body

- The secondary control valve body is composed of two bodies: the secondary lower control valve body, and secondary main control valve body.



E6U517AS5026

SHIFT SOLENOID A, B AND C (DUTY-CYCLE TYPE) OUTLINE

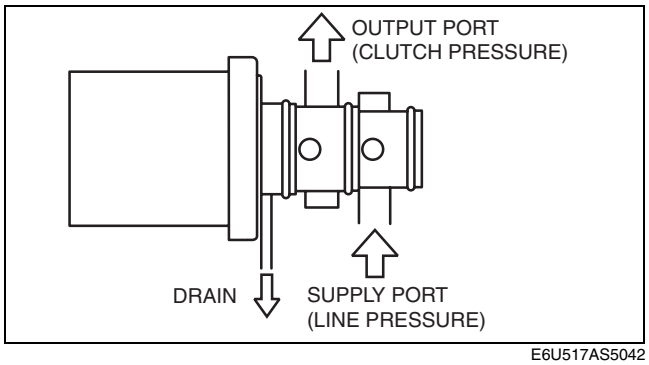
E6U051721101A01

- A clutch pressure direct control, which supplies the clutch pressure directly to each clutch and/or brake, has been adopted. A three-way duty-cycle type solenoids with excellent controllability have been adopted, to improve response.

SHIFT SOLENOID A, B AND C (DUTY-CYCLE TYPE) FUNCTION

E6U051721101A02

- The duty-cycle type shift solenoid adjusts the amount of output pressure according to the signal from the TCM, and controls the pressure of each clutch.
- The duty-cycle type shift solenoid, which switches on/off at 50 Hz (20 ms cycle) and controls the output pressure, is adopted. By changing the on time ratio a cycle (0—100%), the solenoid adjusts the time ratio of the open (supply) and close (drain), and maintains the clutch pressure at the designated hydraulic pressure. As a result, the clutch pressure rises when the duty ratio (50 Hz on time ratio) is reduced, and falls when the duty ratio is raised.



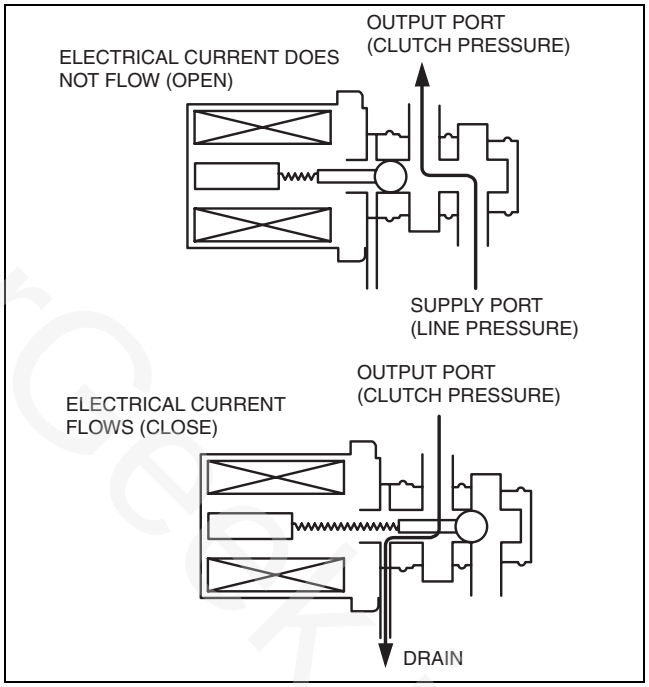
E6U517AS5042

SHIFT SOLENOID A, B AND C (DUTY-CYCLE TYPE) OPERATION

E6U051721101A03

Open:When the electrical current does not flow, the supply port (line pressure) in the solenoid opens and is engaged with the output port (clutch pressure). As a result, hydraulic pressure is supplied to the hydraulic passage for the clutch pressure.

Close:When the electrical current flows, the supply port (line pressure) in the solenoid closes and the output port (clutch pressure) and the drain port are engaged to drain the clutch pressure.



E6U517AS5043

SHIFT SOLENOID D, E AND F (ON/OFF TYPE) OUTLINE

E6U051721101A04

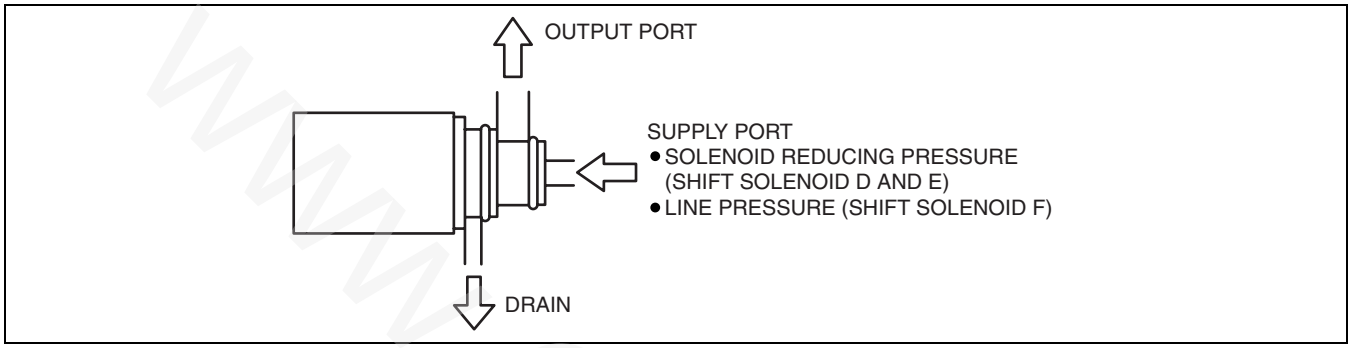
- A compact, light-weight three-way solenoid has been adopted for shift solenoids D, E and F to reduce consumption discharge amount.

Shift solenoid	Function
Shift solenoid D	Switches the bypass valve and 3-4 shift valve.
Shift solenoid E	Switches the low and reverse shift valve and TCC control valve.
Shift solenoid F	Switches the hydraulic passages for each clutch on the sub-shifting side and the brake.

SHIFT SOLENOID D, E AND F (ON/OFF TYPE) FUNCTION

E6U051721101A05

- An on/off type solenoid valve switches the supply drain of output port according to the electrical current flow switching.



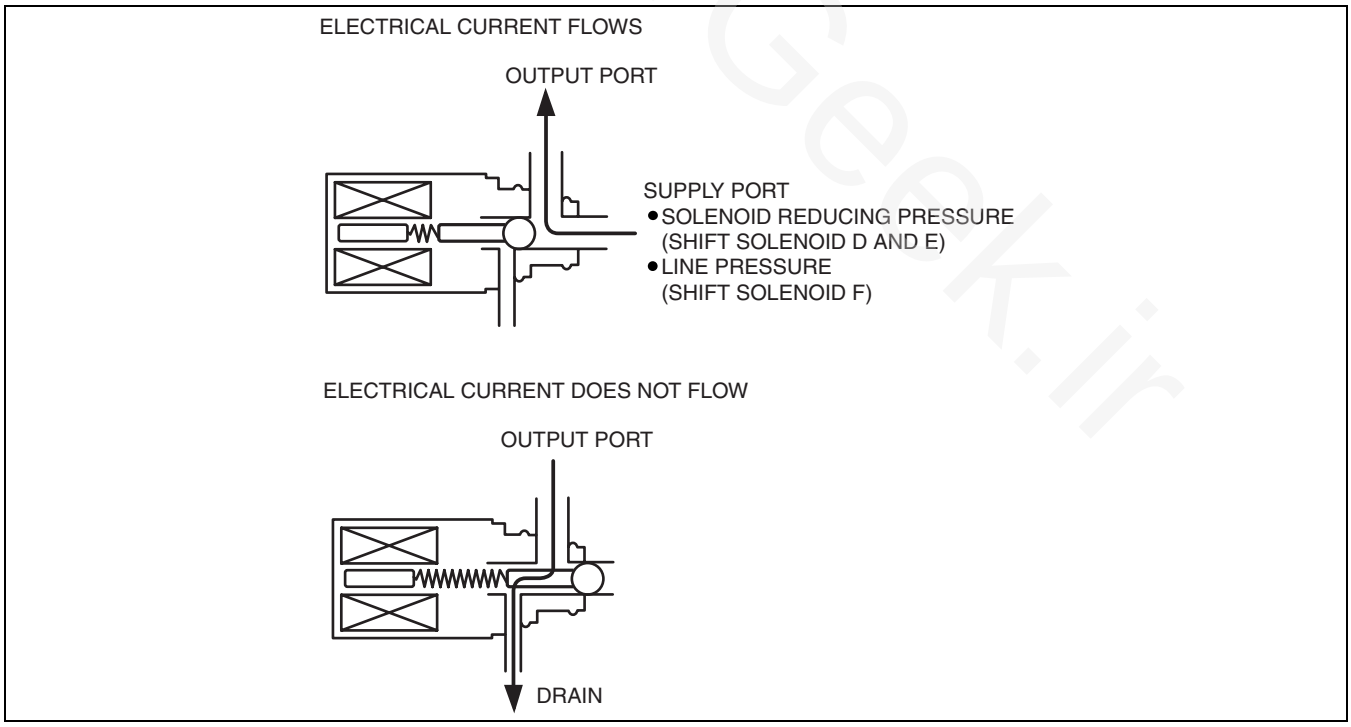
E6U517AS5044

SHIFT SOLENOID D, E AND F (ON/OFF TYPE) OPERATION

E6U051721101A06

On: When the electrical current flows, the output port and the supply port (solenoid reducing pressure or line pressure) are engaged in the solenoid, and the output pressure becomes equivalent to the solenoid reducing pressure.

Off: When the electrical current does not flow, the output port and the drain port are engaged in the solenoid, and the output pressure is drained.



E6U517AS5045

PRESSURE CONTROL SOLENOID A (LINEAR TYPE) OUTLINE

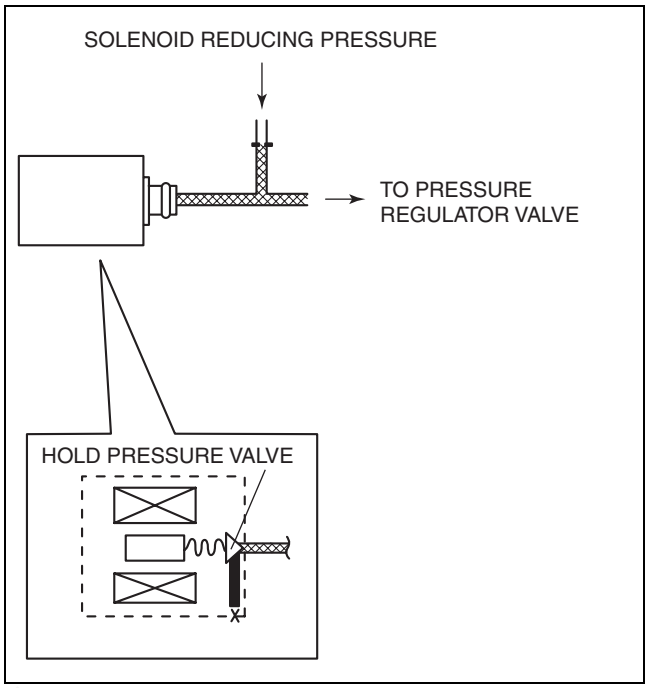
E6U051721101A07

- A pressure control solenoid A with high stability in hydraulic pressure has been adopted for the line pressure control.
- Because the pressure control solenoid controls the hydraulic pressure according to the current value, the degree of freedom in control increases. The controllability is maintained even under aeration, and pressure variation can be reduced.

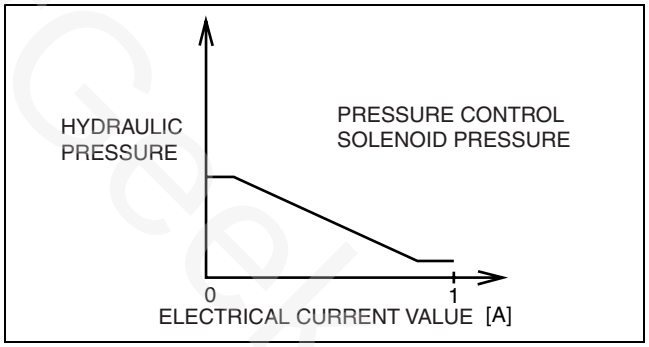
PRESSURE CONTROL SOLENOID A (LINEAR TYPE) OPERATION

E6U051721101A08

- By changing the electrical current value (0 A—1 A) inside the solenoid, the pressure control solenoid A adjusts the hold power of the hold pressure valve, controlling the pressure control solenoid pressure to the prescribed hydraulic pressure.



E6U517AS5039



E6U517AS5040

PRESSURE CONTROL SOLENOID B (DUTY-CYCLE TYPE) OUTLINE

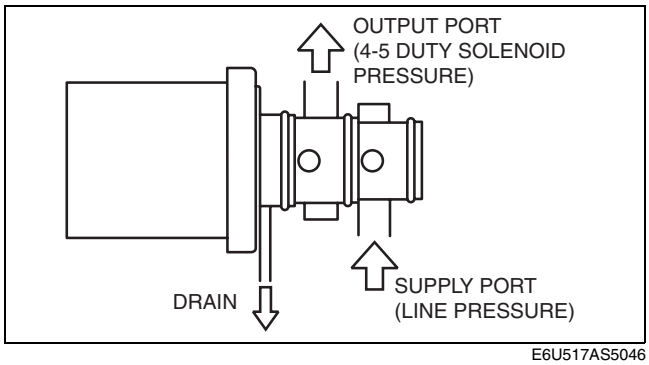
E6U051721101A09

- A clutch pressure direct control, which supplies the clutch pressure directly to each clutch and/or brake, has been adopted. A three-way duty-cycle type solenoids with excellent controllability have been adopted, to improve response.

PRESSURE CONTROL SOLENOID B (DUTY-CYCLE TYPE) FUNCTION

E6U051721101A10

- The duty-cycle type shift solenoid adjusts the amount of output pressure according to the signal from the TCM, and controls the pressure of each clutch.
- The duty-cycle type shift solenoid, which switches on/off at 50 Hz (20 ms cycle) and controls the output pressure, is adopted. By changing the on time ratio a cycle (0—100%), the solenoid adjusts the time ratio of the open (supply) and close (drain), and maintains the 4-5 duty solenoid pressure at the designated hydraulic pressure. As a result, the clutch pressure rises when the duty ratio (50 Hz on time ratio) is reduced, and falls when the duty ratio is raised.



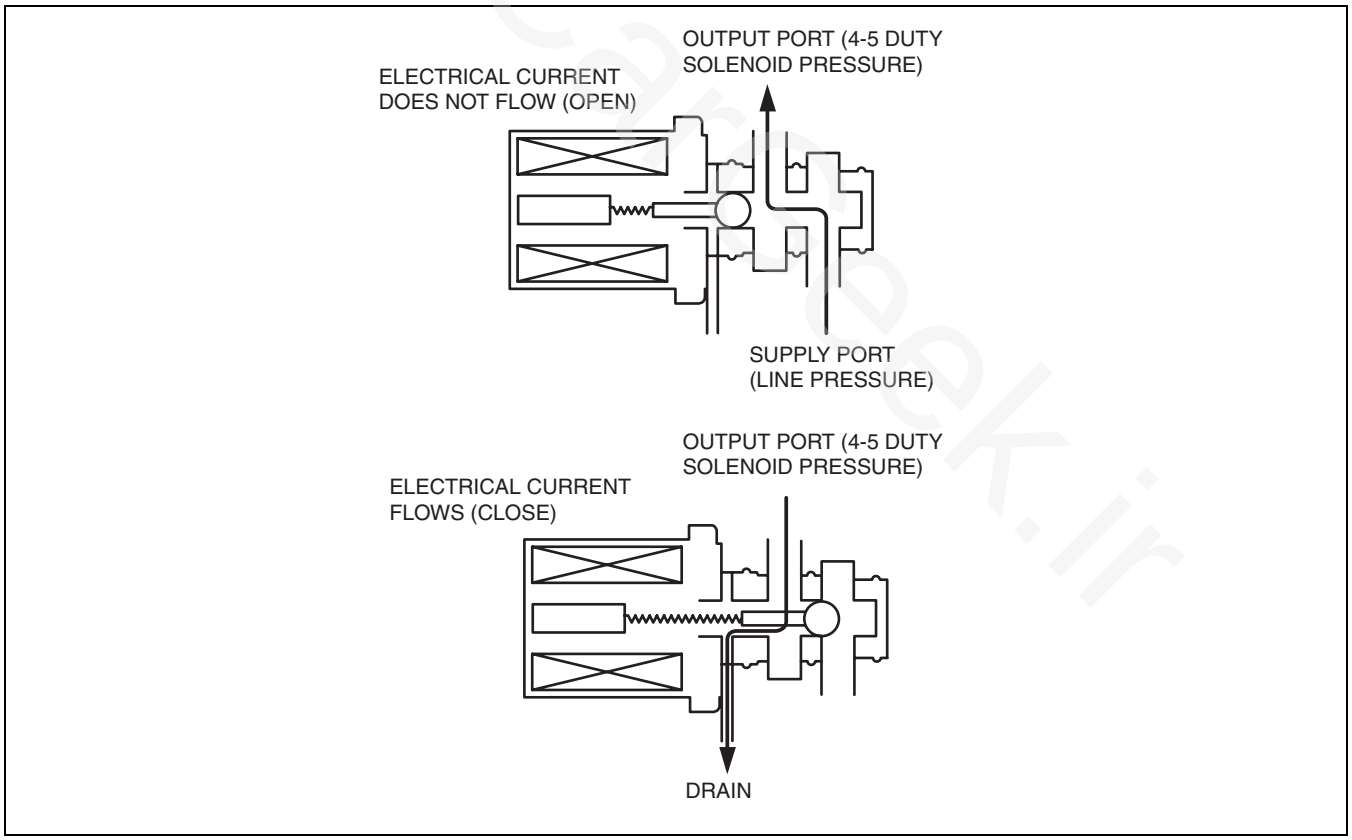
E6U517AS5046

PRESSURE CONTROL SOLENOID B (DUTY-CYCLE TYPE) OPERATION

E6U051721101A11

1GR to 4 GR or 5GR (Open):When driving in 1GR to 4GR or 5GR, the supply port (line pressure) in the solenoid opens and is engaged with the output port (4-5 duty solenoid pressure). As a result, hydraulic pressure is supplied to the hydraulic passage for the 4-5 duty solenoid.

Shifted from 4GR to 5GR or from 5GR to 4GR (Close):When the gear is shifted from 4GR to 5GR or from 5GR to 4GR, the line pressure is regulated to the optimum hydraulic pressure for the driving condition by energizing for a specified time.



E6U517AS5047

SERVICE

GENERAL INFORMATION

00
SECTION

00–00 GENERAL INFORMATION

HOW TO USE THIS MANUAL

E6U000000000A01

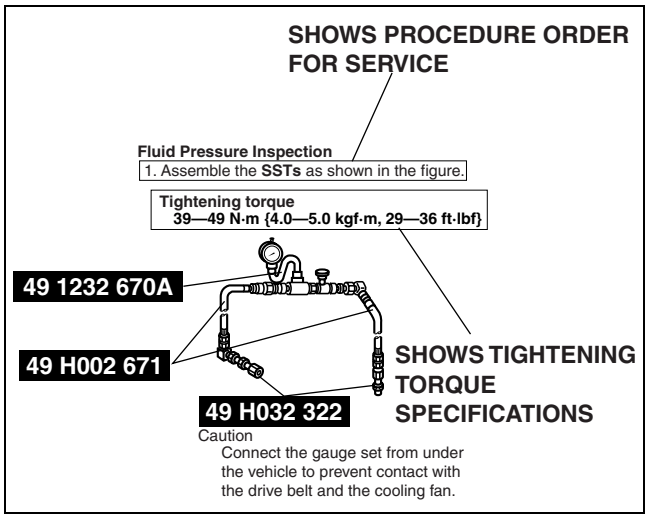
Range of Topics

- This manual contains procedures for performing all required service operations. The procedures are divided into the following five basic operations:
  - — Removal/Installation
  - — Disassembly/Assembly
  - — Replacement
  - — Inspection
  - — Adjustment
- Simple operations which can be performed easily just by looking at the vehicle (i.e., removal/installation of parts, jacking, vehicle lifting, cleaning of parts, and visual inspection) have been omitted.

Service Procedure

Inspection, adjustment

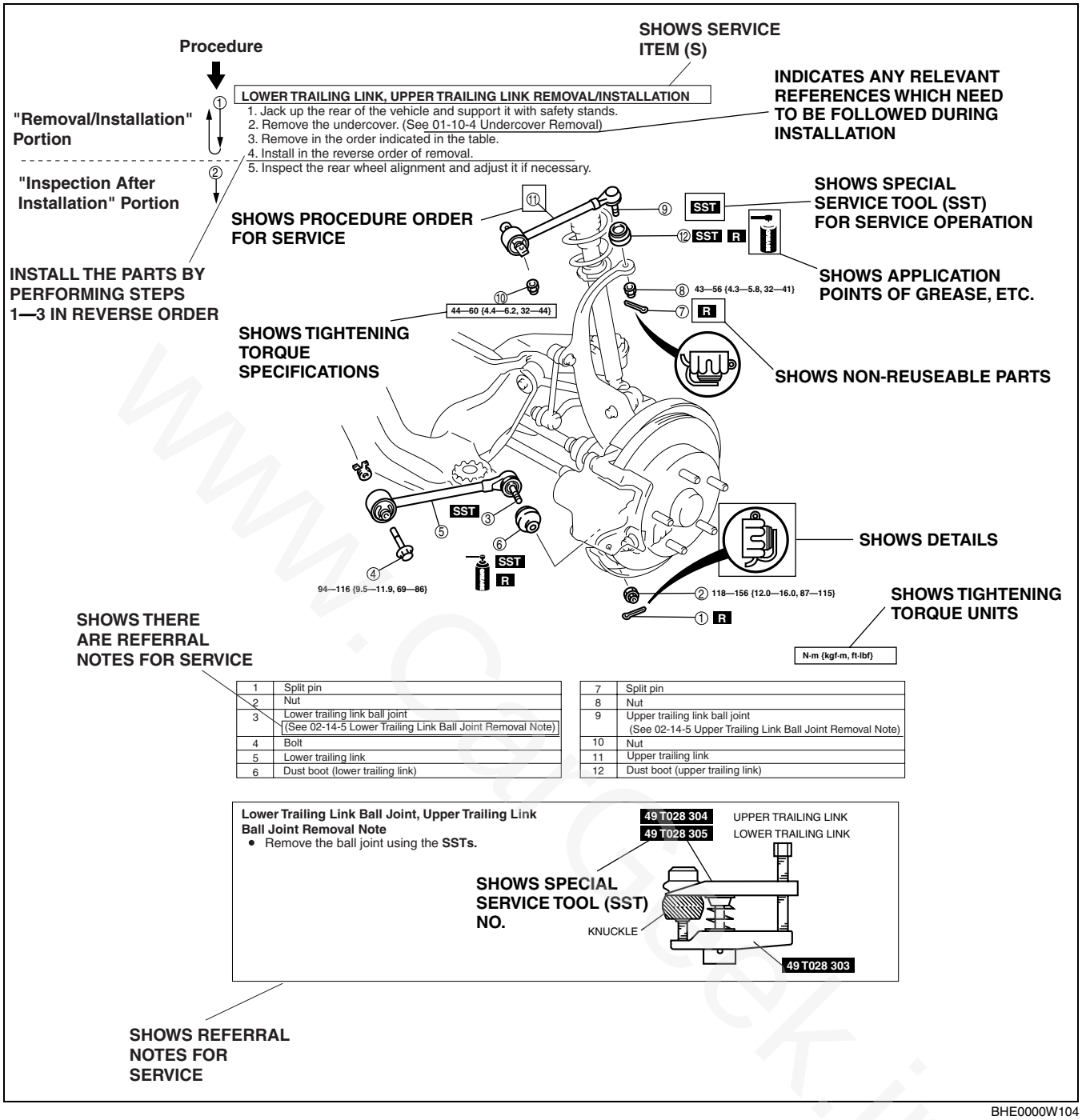
- Inspection and adjustment procedures are divided into steps. Important points regarding the location and contents of the procedures are explained in detail and shown in the illustrations.



WGIWXX0009E

Repair procedure

1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual part inspection. However, only removal/installation procedures that need to be performed methodically have written instructions.
2. Expendable parts, tightening torques, and symbols for oil, grease, and sealant are shown in the overview illustration. In addition, symbols indicating parts requiring the use of special service tools or equivalent are also shown.
3. Procedure steps are numbered and the part that is the main point of that procedure is shown in the illustration with the corresponding number. Occasionally, there are important points or additional information concerning a procedure. Refer to this information when servicing the related part.



1	Split pin	7	Split pin
2	Nut	8	Nut
3	Lower trailing link ball joint (See 02-14-5 Lower Trailing Link Ball Joint Removal Note)	9	Upper trailing link ball joint (See 02-14-5 Upper Trailing Link Ball Joint Removal Note)
4	Bolt	10	Nut
5	Lower trailing link	11	Upper trailing link
6	Dust boot (lower trailing link)	12	Dust boot (upper trailing link)

BHE0000W104

Symbols

- There are eight symbols indicating oil, grease, fluids, sealant, and the use of **SST** or equivalent. These symbols show application points or use of these materials during service.

Symbol	Meaning	Kind
	Apply oil	New appropriate engine oil or gear oil
	Apply brake fluid	New appropriate brake fluid
	Apply automatic transaxle/ transmission fluid	New appropriate automatic transaxle/ transmission fluid
	Apply grease	Appropriate grease
	Apply sealant	Appropriate sealant
	Apply petroleum jelly	Appropriate petroleum jelly
R	Replace part	O-ring, gasket, etc.
SST	Use SST or equivalent	Appropriate tools

Advisory Messages

- You will find several **Warnings**, **Cautions**, **Notes**, **Specifications** and **Upper and Lower Limits** in this manual.

Warning

- A Warning indicates a situation in which serious injury or death could result if the warning is ignored.

Caution

- A Caution indicates a situation in which damage to the vehicle or parts could result if the caution is ignored.

Note

- A Note provides added information that will help you to complete a particular procedure.

Specification

- The values indicate the allowable range when performing inspections or adjustments.

Upper and lower limits

- The values indicate the upper and lower limits that must not be exceeded when performing inspections or adjustments.

UNITS

E6U000000000A02

Electric current	A (ampere)
Electric power	W (watt)
Electric resistance	ohm
Electric voltage	V (volt)
Length	mm (millimeter)
	in (inch)
Negative pressure	kPa (kilo pascal)
	mmHg (millimeters of mercury)
	inHg (inches of mercury)
Positive pressure	kPa (kilo pascal)
	kgf/cm^2 (kilogram force per square centimeter)
	psi (pounds per square inch)
Number of revolutions	rpm (revolutions per minute)
Torque	N·m (Newton meter)
	kgf·m (kilogram force meter)
	kgf·cm (kilogram force centimeter)
	ft·lbf (foot pound force)
	in·lbf (inch pound force)
Volume	L (liter)
	US qt (U.S. quart)
	Imp qt (Imperial quart)
	ml (milliliter)
	cc (cubic centimeter)
	cu in (cubic inch)
	fl oz (fluid ounce)
Weight	g (gram)
	oz (ounce)

Conversion to SI Units (Système International d'Unités)

- All numerical values in this manual are based on SI units. Numbers shown in conventional units are converted from these values.

Rounding Off

- Converted values are rounded off to the same number of places as the SI unit value. For example, if the SI unit value is 17.2 and the value after conversion is 37.84, the converted value will be rounded off to 37.8.

Upper and Lower Limits

- When the data indicates upper and lower limits, the converted values are rounded down if the SI unit value is an upper limit and rounded up if the SI unit value is a lower limit. Therefore, converted values for the same SI unit value may differ after conversion. For example, consider 2.7 kgf/cm^2 in the following specifications:

  210—260 kPa {2.1—2.7 kgf/cm^2, 30—38 psi}
  270—310 kPa {2.7—3.2 kgf/cm^2, 39—45 psi}

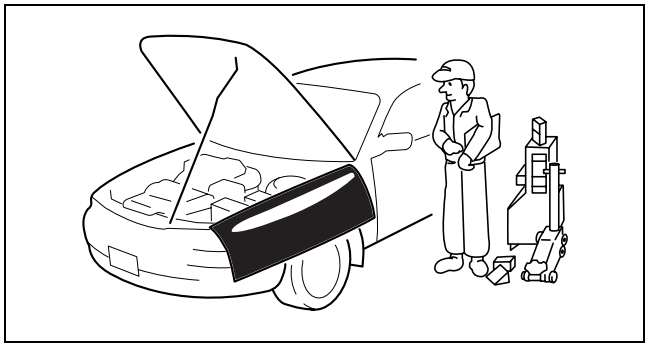
- The actual converted values for 2.7 kgf/cm^2 are 264 kPa and 38.4 psi. In the first specification, 2.7 is used as an upper limit, so the converted values are rounded down to 260 and 38. In the second specification, 2.7 is used as a lower limit, so the converted values are rounded up to 270 and 39.

FUNDAMENTAL PROCEDURES

E6U000000000A03

Preparation of Tools and Measuring Equipment

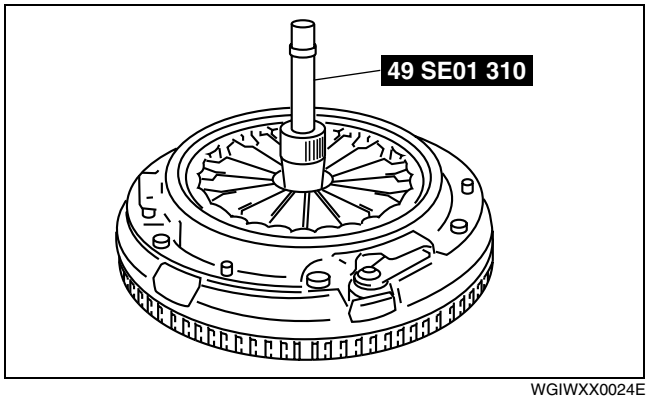
- Be sure that all necessary tools and measuring equipment are available before starting any work.



CHU0014W003

Special Service Tools

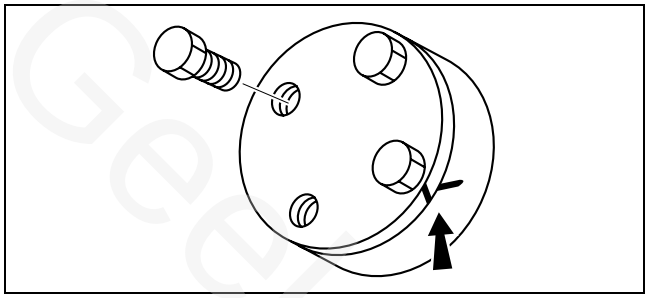
- Use special service tools or equivalent when they are required.



WGIWXX0024E

Disassembly

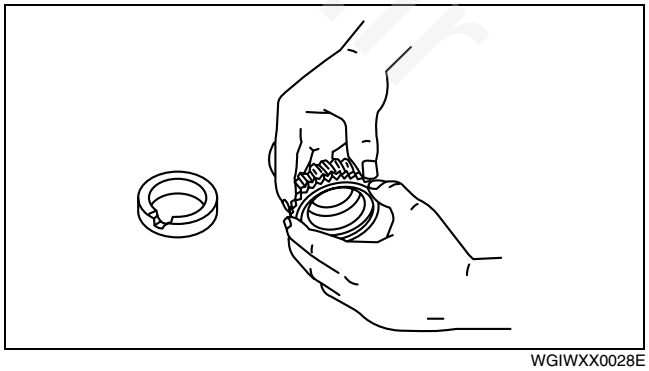
- If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be marked in a place that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.



WGIWXX0027E

Inspection During Removal, Disassembly

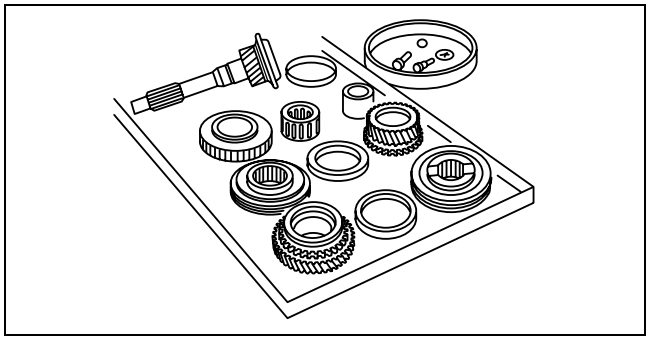
- When removed, each part should be carefully inspected for malfunction, deformation, damage and other problems.



WGIWXX0028E

Arrangement of Parts

- All disassembled parts should be carefully arranged for reassembly.
- Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.

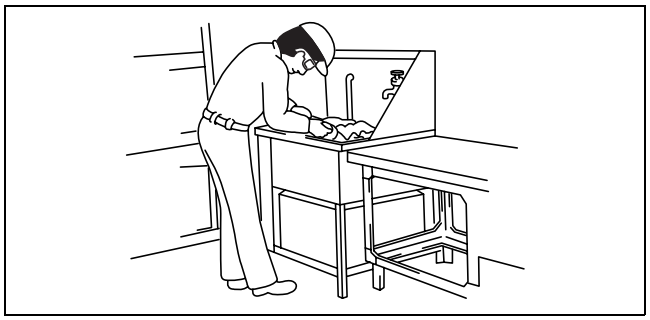


WGIWXX0029E

Cleaning of Parts

- All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.

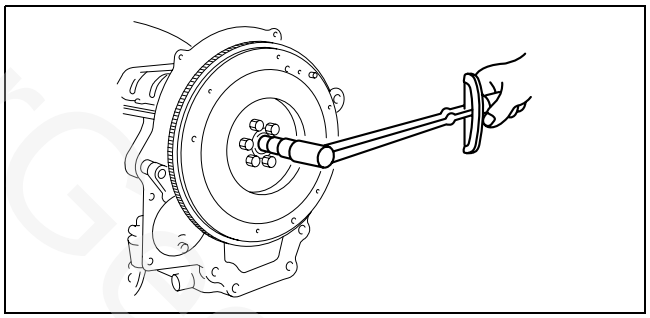
  Warning
  - **Using compressed air can cause dirt and other particles to fly out causing injury to the eyes. Wear protective eye wear whenever using compressed air.**



C5U0000W001

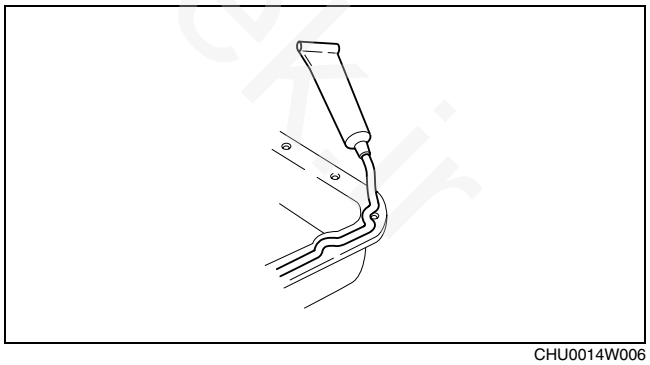
Reassembly

- Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
- If removed, the following parts should be replaced with new ones:
  — Oil seals
  — Gaskets
  — O-rings
  — Lockwashers
  — Cotter pins
  — Nylon nuts



WGIWXX0031E

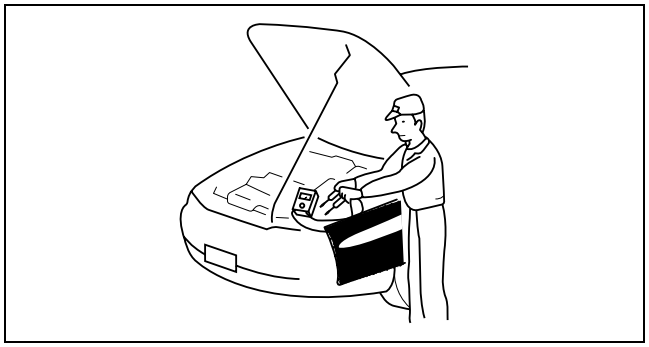
- Depending on location:
  — Sealant and gaskets, or both, should be applied to specified locations. When sealant is applied, parts should be installed before sealant hardens to prevent leakage.
  — Oil should be applied to the moving components of parts.
  — Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



CHU0014W006

Adjustment

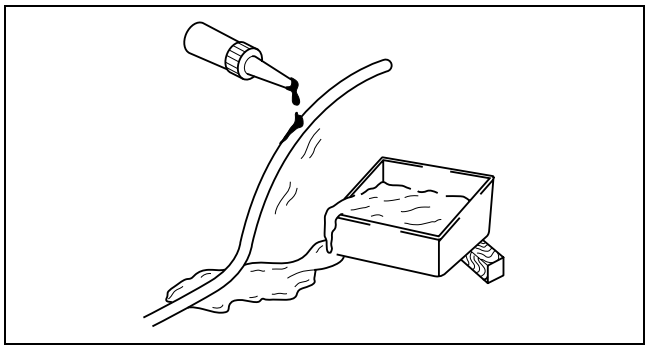
- Use suitable gauges and testers when making adjustments.



CHU0014W005

Rubber Parts and Tubing

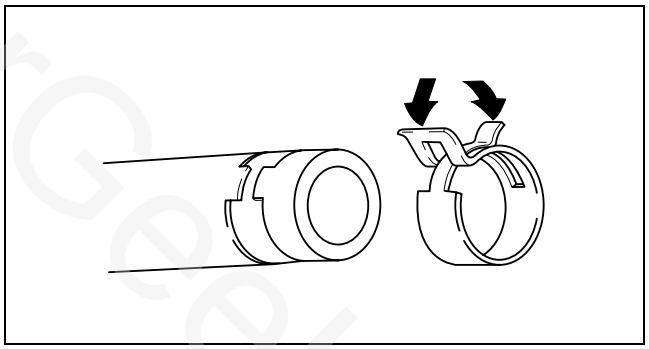
- Prevent gasoline or oil from getting on rubber parts or tubing.



WGIWXX0034E

Hose Clamps

- When reinstalling, position the hose clamp in the original location on the hose and squeeze the clamp lightly with large pliers to ensure a good fit.

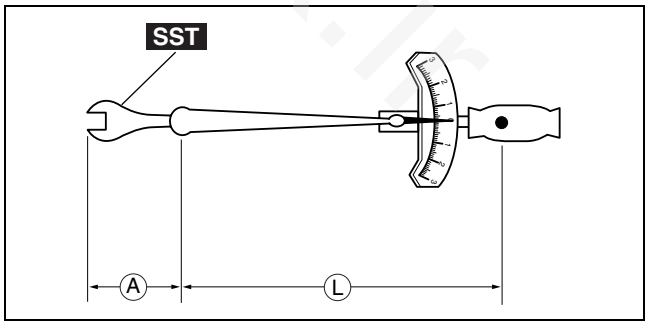


WGIWXX0035E

Torque Formulas

- When using a torque wrench-**SST** or equivalent combination, the written torque must be recalculated due to the extra length that the **SST** or equivalent adds to the torque wrench. Recalculate the torque by using the following formulas. Choose the formula that applies to you.

Torque Unit	Formula
N·m	N·m × [L/ (L+A)]
kgf·m	kgf·m × [L/ (L+A)]
kgf·cm	kgf·cm × [L/ (L+A)]
ft·lbf	ft·lbf × [L/ (L+A)]
in·lbf	in·lbf × [L/ (L+A)]

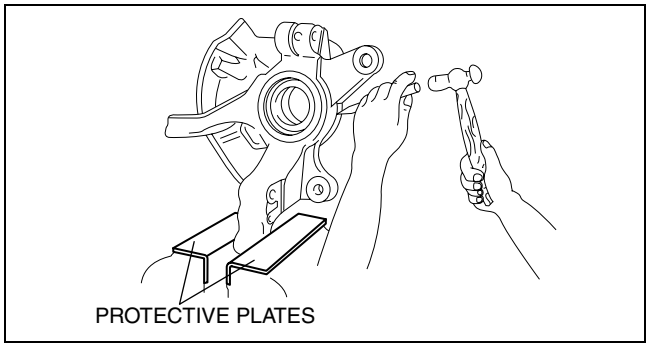


WGIWXX0036E

A : The length of the **SST** past the torque wrench drive.
L : The length of the torque wrench.

Vise

- When using a vise, put protective plates in the jaws of the vise to prevent damage to parts.



CHU0014W010

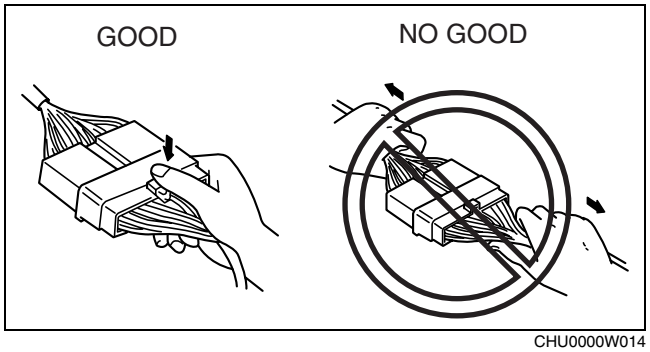
ELECTRICAL SYSTEM

E6U000000000A04

Connectors

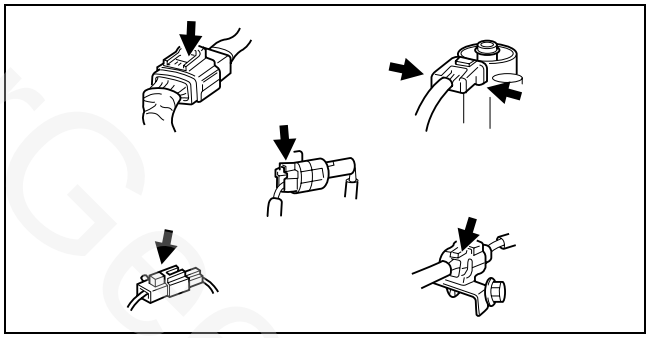
Disconnecting connectors

- When disconnecting connector, grasp the connectors, not the wires.



CHU0000W014

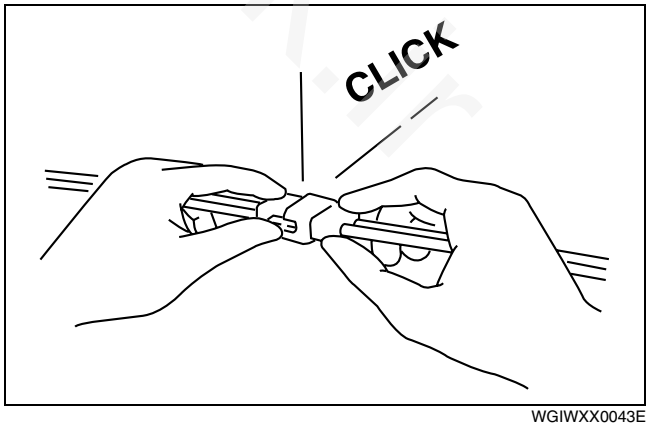
- Connectors can be disconnected by pressing or pulling the lock lever as shown.



WGIWXX0042E

Locking connector

- When locking connectors, listen for a click indicating they are securely locked.



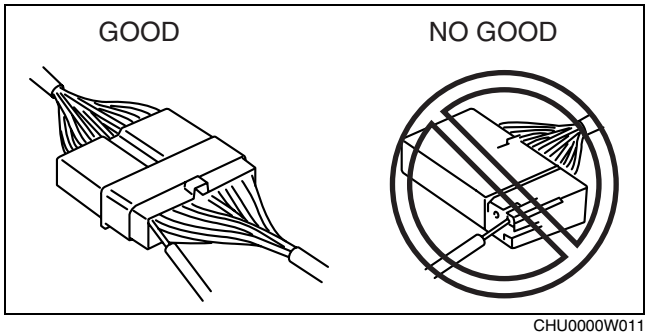
WGIWXX0043E

Inspection

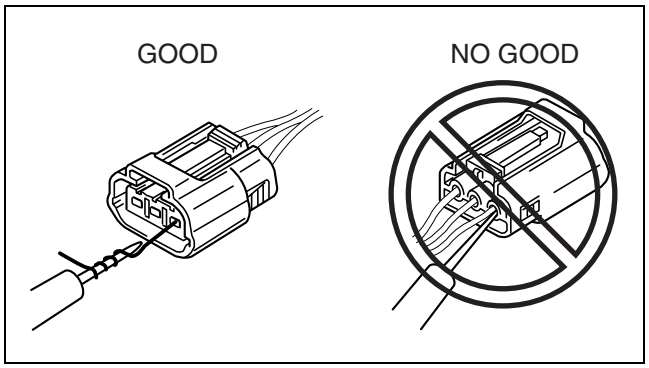
- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.
- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

Caution

- **To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.**



CHU0000W011



CHU0000W012

SAE STANDARDS

E6U000000000A07

- In accordance with new regulations, SAE (Society of Automotive Engineers) standard names and abbreviations are now used in this manual. The table below lists the names and abbreviations that have been used in Mazda manuals up to now and their SAE equivalents.

SAE Standard		Remark
Abbreviation	Name	
AP	Accelerator Pedal	
APP	Accelerator Pedal Position	
ACL	Air Cleaner	
A/C	Air Conditioning	
A/F	Air Fuel Ratio	
BARO	Barometric Pressure	
B+	Battery Positive Voltage	
CMP sensor	Camshaft Position Sensor	
LOAD	Calculated Load Value	
CAC	Charge Air Cooler	
CLS	Closed Loop System	
CTP	Closed Throttle Position	
CPP	Clutch Pedal Position	
CIS	Continuous Fuel Injection System	
CKP sensor	Crankshaft Position Sensor	
DLC	Data Link Connector	
DTM	Diagnostic Test Mode	#1
DTC	Diagnostic Test Code(s)	
DI	Distributor Ignition	
DLI	Distributorless Ignition	
EI	Electronic Ignition	#2
ECT	Engine Coolant Temperature	
EM	Engine Modification	
EVAP	Evaporative Emission	
EGR	Exhaust Gas Recirculation	
FC	Fan Control	

SAE Standard		Remark
Abbreviation	Name	
MAP	Manifold Absolute Pressure	
MAF	Mass Air Flow	
MAF sensor	Mass Air Flow Sensor	
MFL	Multiport Fuel Injection	
OBD	On-board Diagnostic System	
OL	Open Loop	
OC	Oxidation Catalytic Converter	
O2S	Oxygen Sensor	
PNP	Park/Neutral Position	
PID	Parameter Identification	
PSP	Power Steering Pressure	
PCM	Powertrain Control Module	#3
PAIR	Pulsed Secondary Air Injection	Pulsed injection
AIR	Secondary Air Injection	Injection with air pump
SAPV	Secondary Air Pulse Valve	
SFI	Sequential Multiport Fuel Injection	
3GR	Third Gear	
TWC	Three Way Catalytic Converter	
TB	Throttle Body	
TP	Throttle Position	
TP sensor	Throttle Position Sensor	
TCC	Torque Converter Clutch	

SAE Standard		Remark		SAE Standard		Remark
Abbreviation	Name			Abbreviation	Name	
FF	Flexible Fuel			TCM	Transmission (Transaxle) Control Module	
4GR	Fourth Gear			TR	Transmission (Transaxle) Range	
GEN	Generator			TC	Turbocharger	
GND	Ground			VSS	Vehicle Speed Sensor	
HO2S	Heated Oxygen Sensor	With heater		VR	Voltage Regulator	
IAC	Idle Air Control			VAF sensor	Volume Air Flow Sensor	
IAT	Intake Air Temperature			WU-TWC	Warm Up Three Way Catalytic Converter	#4
KS	Knock Sensor					
MIL	Malfunction Indicator Lamp			WOP	Wide Open Throttle	

#1 : Diagnostic trouble codes depend on the diagnostic test mode.
#2 : Controlled by the PCM
#3 : Device that controls engine and powertrain
#4 : Directly connected to exhaust manifold

ABBREVIATIONS

E6U000000000A06

SST	Special Service Tools
TFT	Transaxle Fluid Temperature
ATF	Automatic Transaxle Fluid

TRANSMISSION/TRANSAXLE

05 SECTION

05–17 AUTOMATIC TRANSAXLE

AUTOMATIC TRANSAXLE CLEANING

E6U051700000A09

Cleaning Notes

1. Clean the transaxle exterior thoroughly with steam, cleaning solvents, or both, before disassembly.

   Warning
   - **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

2. Clean the removed parts with cleaning solvent, and dry with compressed air. Clean out all holes and passages with compressed air, and verify that there are no obstructions.

AUTOMATIC TRANSAXLE DISASSEMBLY

E6U051700000A10

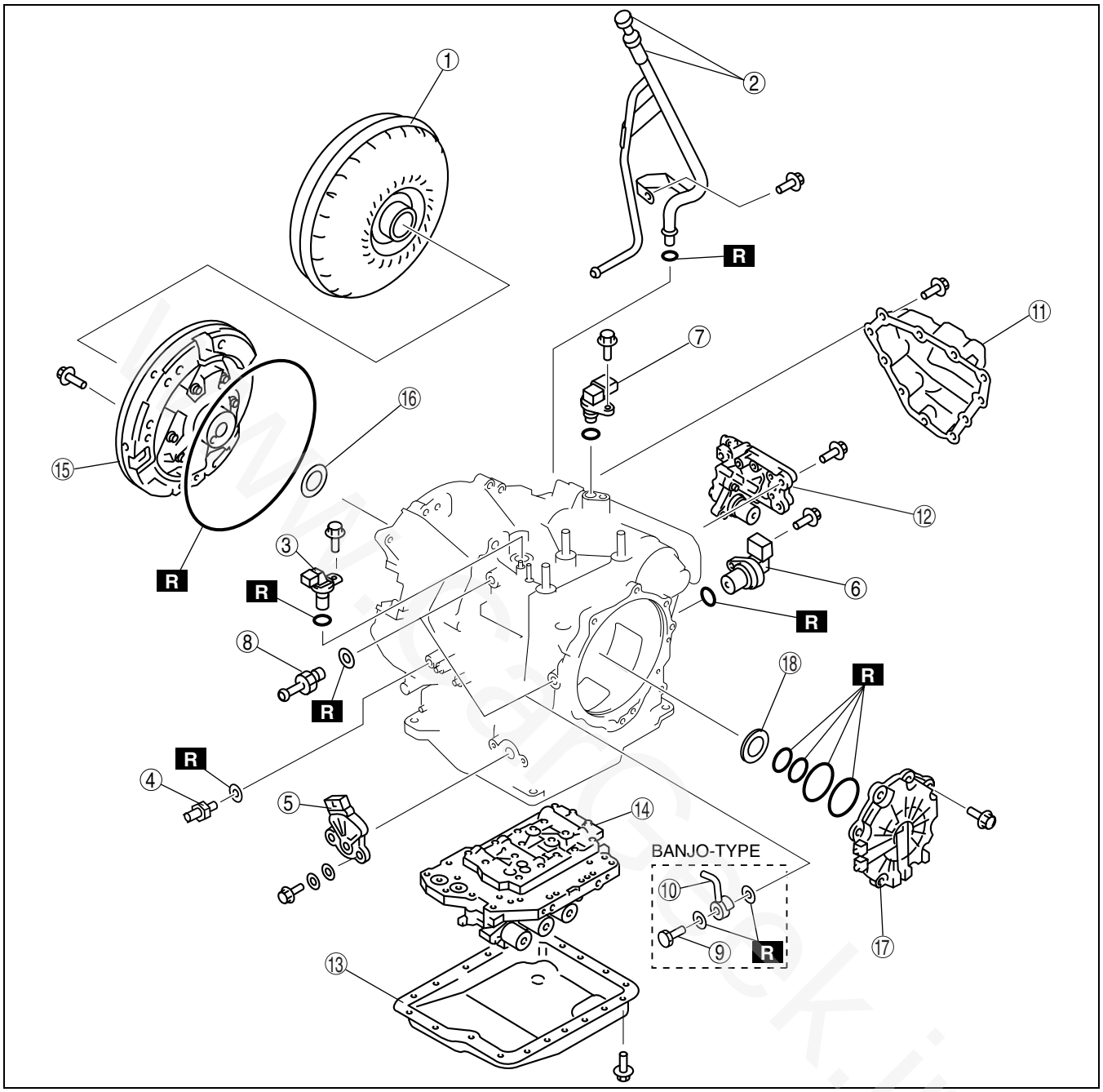
Precaution

General notes

- The oil pan could contain small chips, shavings, and other particles which may be helpful in inspecting the condition of the transaxle and diagnosing certain problems.
  To ensure that all foreign particles stay in the oil pan, make sure that the transaxle is never tipped completely over while the oil pan is still installed.
  1. Disassemble the transaxle in a clean area (dustproof work space) to prevent entry of dust into the mechanisms.
  2. Inspect the individual transaxle components in accordance with the QUICK DIAGNOSIS CHART during disassembly.
  3. Use only plastic hammers when applying force to separate the light alloy case joints.
  4. Never use rags during disassembly; they may leave particles that can clog fluid passage.
  5. Several parts resemble one another; arrange them so that they do not get mixed up.
  6. Disassemble the control valve component and thoroughly clean it when the clutch or brake band has burned or when the ATF has degenerated.

  Warning
  - **Although the stand has a self-locking brake system, there is a possibility that the brake may not hold when the transaxle is held in a lopsided position on the stand. This would cause the transaxle to turn suddenly, causing serious injury. Never keep the transaxle tilted to one side. Always hold the rotating handle firmly when turning the transaxle.**

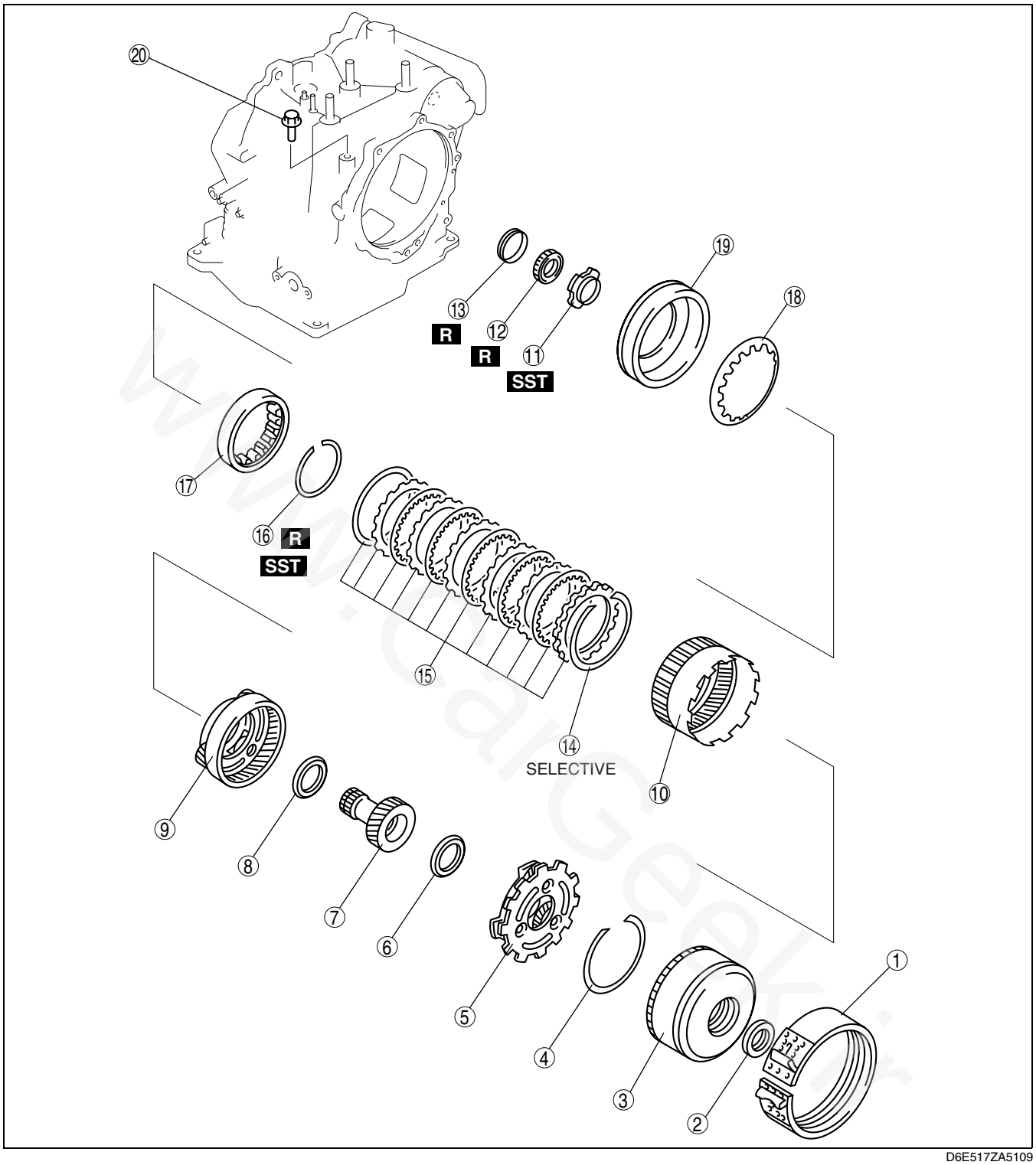
Disassembly
Components



E6U517ZA6001

1	Torque converter
2	Oil dipstick and oil filler tube
3	Input/turbine speed sensor
4	Oil pressure switch
5	Transaxle range switch
6	Vehicle speed sensor
7	Intermediate sensor
8	Connector pipe
9	Connector bolt

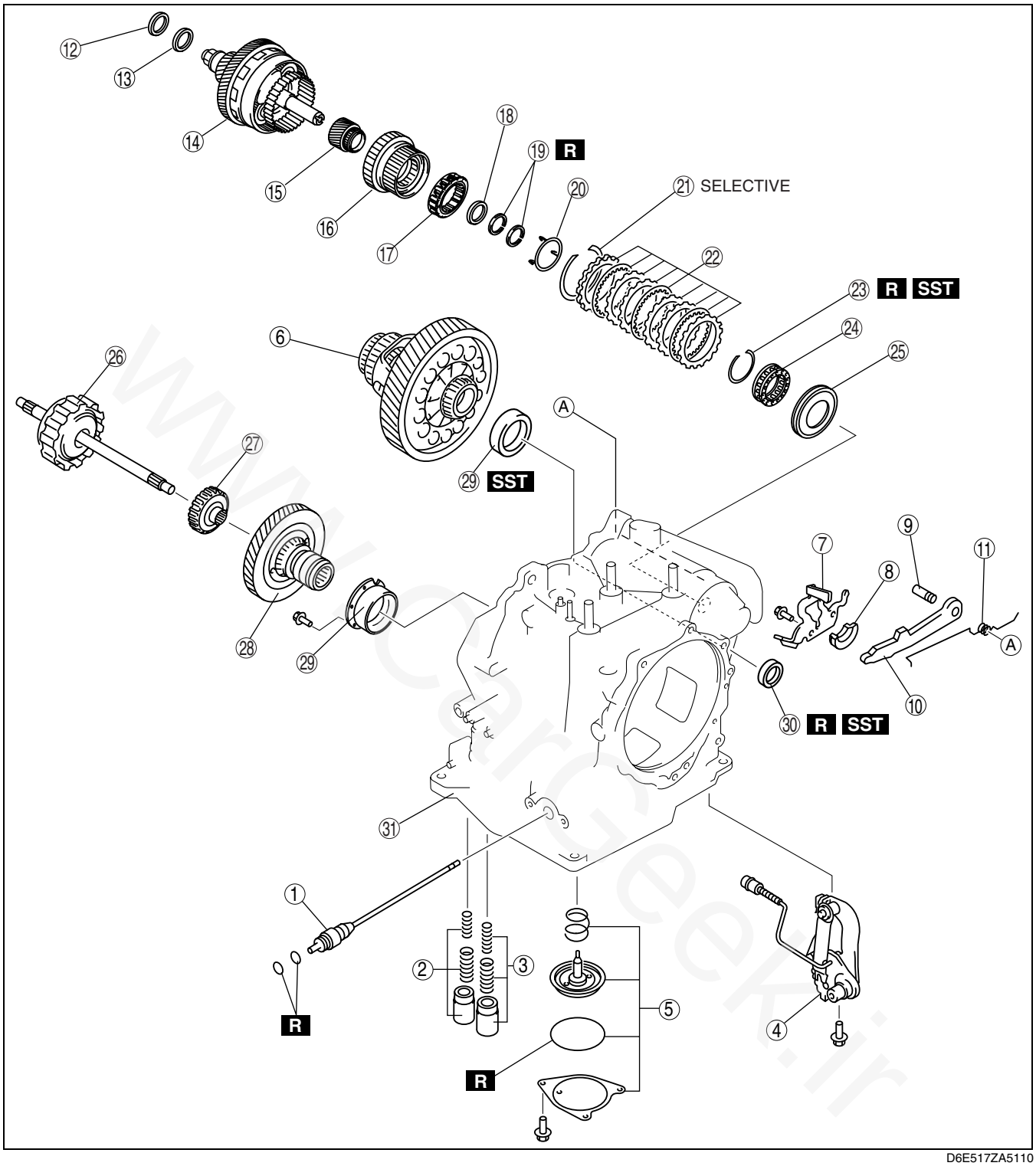
10	Oil pipe
11	Oil cover
12	Secondary control valve body component
13	Oil pan
14	Primary control valve body component
15	Oil pump
16	Thrust washer
17	End cover
18	Bearing race



D6E517ZA5109

1	2–4 brake band
2	Needle bearing
3	Clutch component
4	Snap ring
5	Rear planetary gear component
6	Needle bearing
7	Front sun gear
8	Needle bearing
9	Front planetary gear component
10	Front internal gear and one-way clutch

11	Lock nut
12	Bearing
13	Distance piece
14	Snap ring
15	Low and reverse brake
16	Snap ring
17	One-way clutch inner race
18	Piston return spring
19	Low and reverse brake piston
20	Band strut



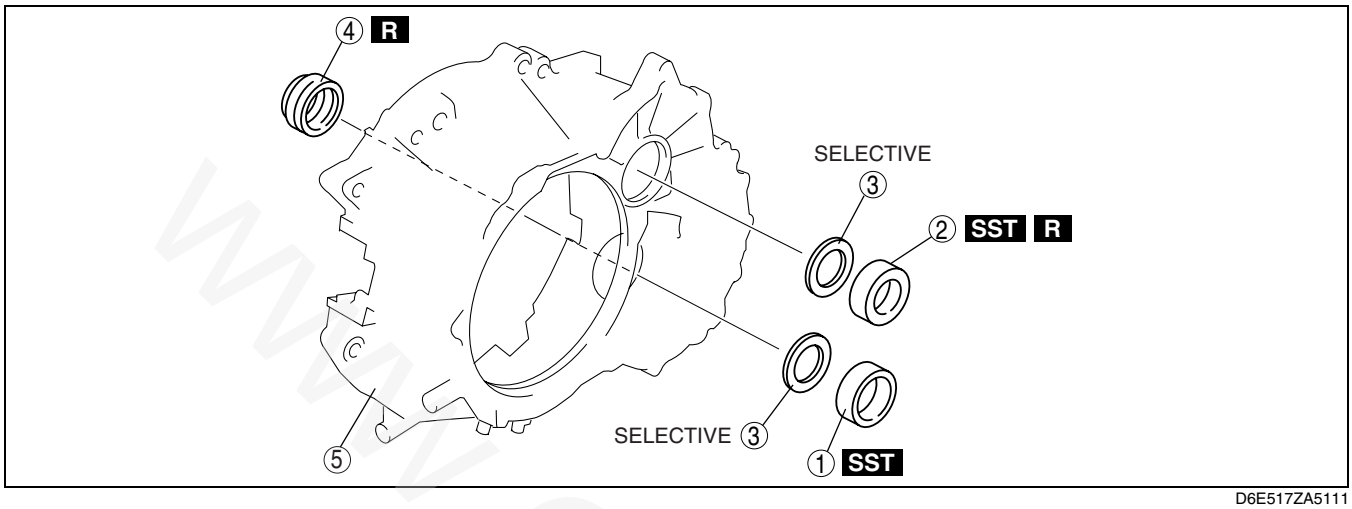
D6E517ZA5110

1	Manual shaft
2	Servo apply accumulator
3	Forward accumulator
4	Parking rod lever component
5	Band servo
6	Differential
7	Actuator plate
8	Support actuator
9	Parking pawl shaft
10	Parking pawl

11	Pawl return spring
12	Needle bearing
13	Bearing race
14	Output gear component
15	Secondary sun gear
16	Direct clutch component
17	One-way clutch No.2
18	Needle bearing
19	Seal rings
20	Spacer

21	Snap ring
22	Reduction brake
23	Snap ring
24	Springs and retainer component
25	Reduction brake piston
26	Forward clutch

27	Forward clutch hub
28	Primary gear
29	Bearing race
30	Oil seal
31	Transaxle case



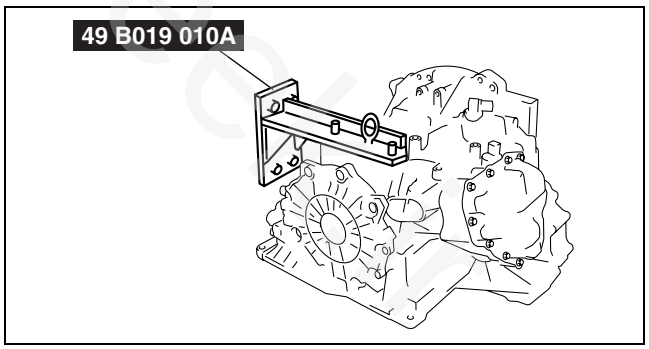
D6E517ZA5111

1	Bearing race
2	Bearing
3	Adjustment shim

4	Oil seal
5	Converter housing

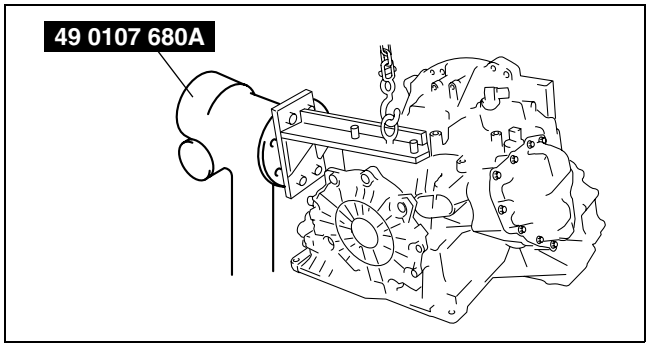
Disassembly procedure

1. Remove the torque converter, and immediately turn it so that the hole faces upward. This will help to keep any remaining fluid from spilling.
2. Remove the ATF dipstick and oil filler tube.
3. Remove the O-ring from the oil filler tube.
4. Remove the breather hose.
5. Assemble the **SST**.



D6J517ZA4130

6. Lift the transaxle and mount it on the **SST**.
7. Remove the input/turbine speed sensor.
8. Remove the O-ring from the input/turbine speed sensor.
9. Remove the oil pressure switch.
10. Remove the transaxle range switch.
11. Remove the vehicle speed sensor.
12. Remove the O-ring from the vehicle speed sensor.
13. Remove the intermediate sensor.
14. Remove the O-ring from the intermediate sensor.
15. Remove the connector pipe, connector bolt and oil pipe.



D6J517ZA4131

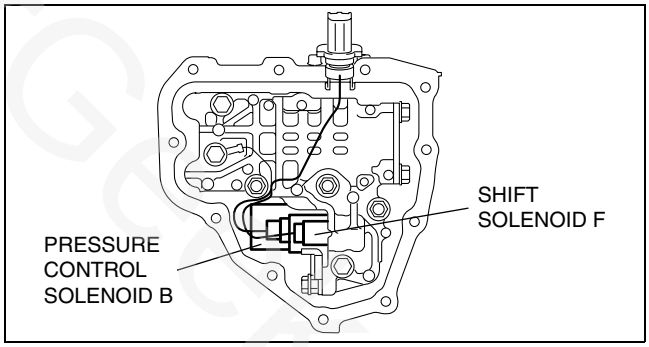
Warning

- **Using compressed air can cause dirt and other particles to fly, out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

Caution

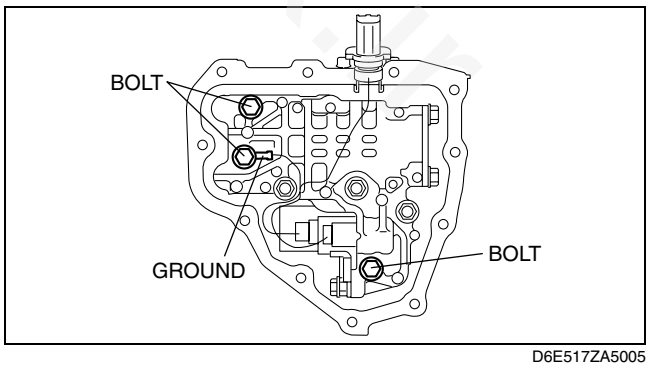
- **Clean the transaxle exterior thoroughly with a steam cleaner or cleaning solvents before removal.**
- **If any old sealant gets into the transaxle during installation of the oil cover, trouble may occur in the transaxle. Remove any old sealant from the transaxle case and oil cover, and clean with cleaning fluids.**

16. Remove the oil cover.
    Examine any material found in the pan or on the magnet to determine the condition of the transaxle. If large amounts of material are found, replace the torque converter and carefully inspect the transaxle for the cause.
    (1) Clutch facing material
        - Drive plate and brake band wear
    (2) Steel (magnetic)
        - Bearing, gear, and driven plate wear
    (3) Aluminum (nonmagnetic)
        - Aluminum part wear
17. Disconnect the solenoid valve connector.



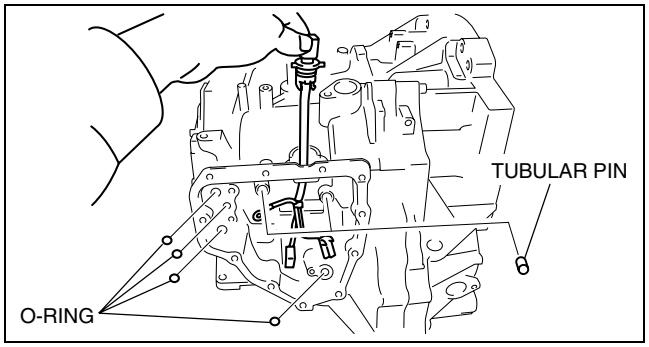
D6E517ZA5004

18. Remove the bolts as shown in the figure.
19. Remove the secondary control valve body.



D6E517ZA5005

20. Remove the coupler component.
21. Remove the O-rings and tubular pins from the transaxle case.



D6E517ZA5009

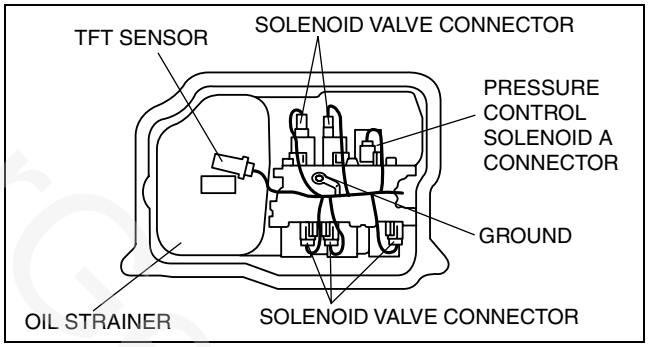
Warning

- **Using compressed air can cause dirt and other particles to fly, out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

Caution

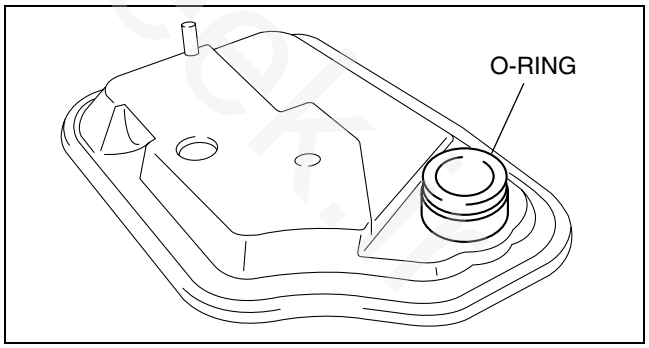
- **Clean the transaxle exterior thoroughly with a steam cleaner or cleaning solvents before removal.**
- **If any old sealant gets into the transaxle during installation of the oil pan, trouble may occur in the transaxle. Remove any old sealant from the transaxle case and oil pan, and clean with cleaning fluids.**

22. Remove the oil pan.
    Examine any material found in the pan or on the magnet to determine the condition of the transaxle. If large amounts of material are found, replace the torque converter and carefully inspect the transaxle for the cause.
    (1) Clutch facing material
        - Drive plate and brake band wear
    (2) Steel (magnetic)
        - Bearing, gear, and driven plate wear
    (3) Aluminum (nonmagnetic)
        - Aluminum part wear
23. Disconnect the solenoid valve connector, ground, and TFT sensor.
24. Remove the oil strainer.



E6U517AW5007

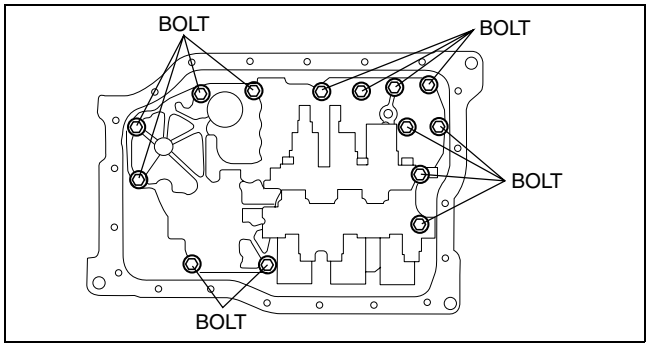
25. Remove the O-ring from the oil strainer.



D6E517ZA5099

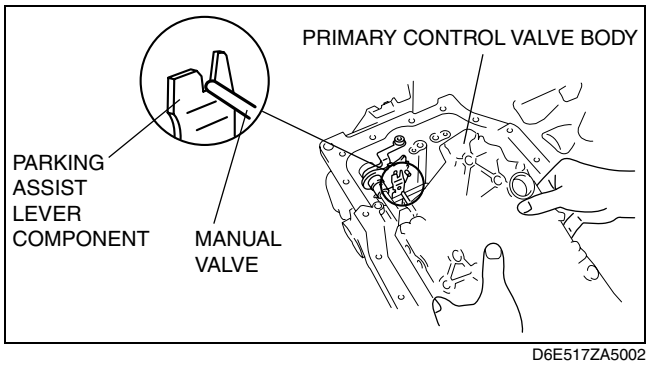
26. Remove the bolts as shown in the figure.

Note
- Remove the control valve body by removing the head of the manual valve from the port of the parking assist lever component.



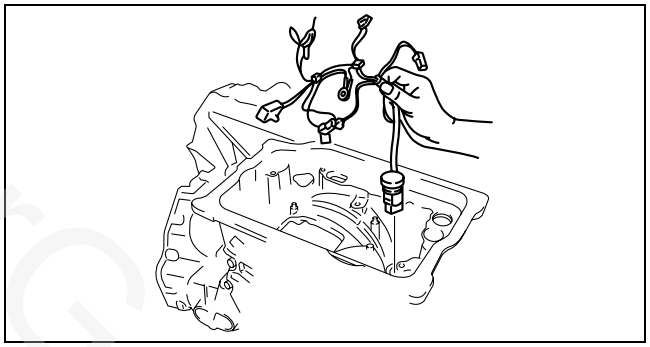
D6E517AW5029

27. Remove the Primary control valve body.



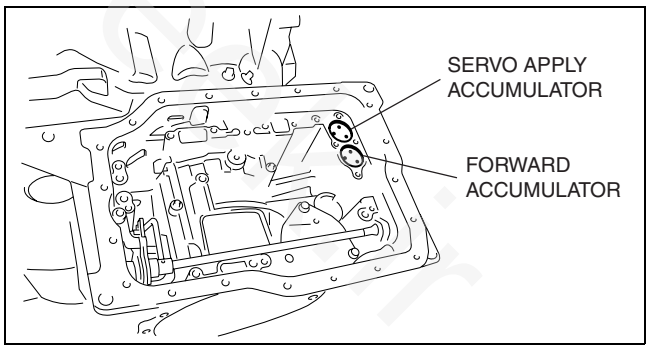
D6E517ZA5002

28. Remove the coupler component.



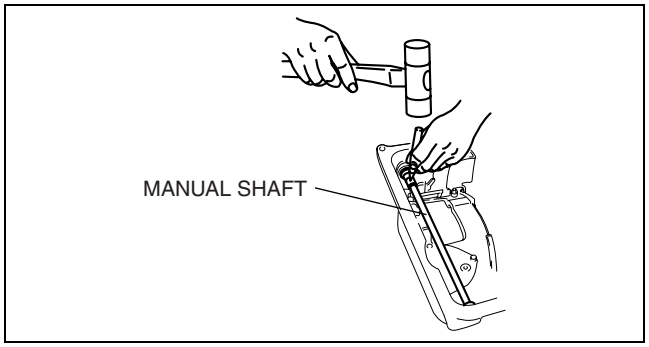
D6J517ZA4008

29. Remove the accumulator component.



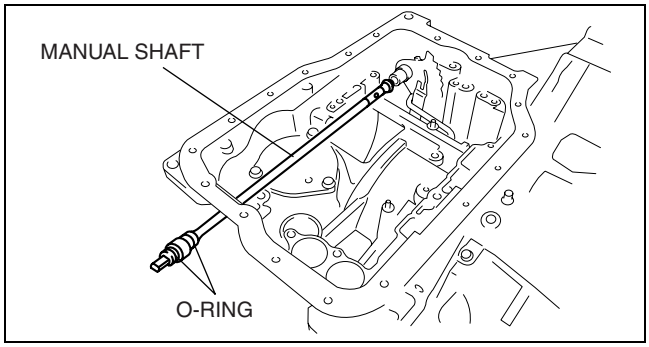
D6E517ZA5011

30. Remove the manual shaft.
    (1) Remove the roll pin using a pin punch.



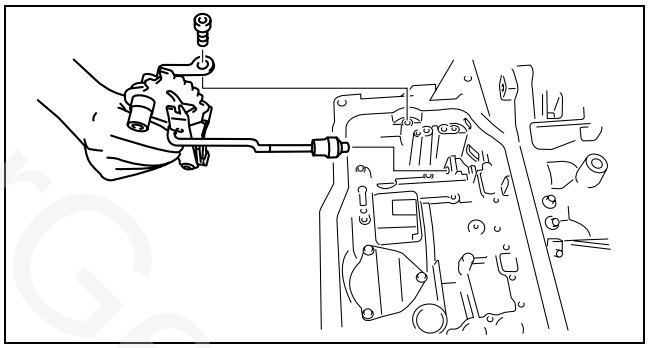
D6E517ZA5012

    (2) Remove the manual shaft.
    (3) Remove the O-ring from the manual shaft.



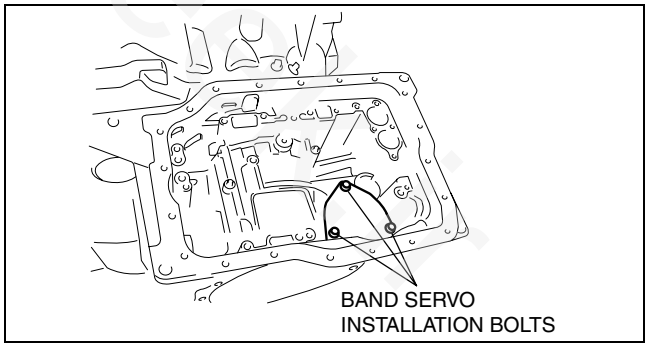
D6E517ZA5013

31. Remove the parking rod lever component.



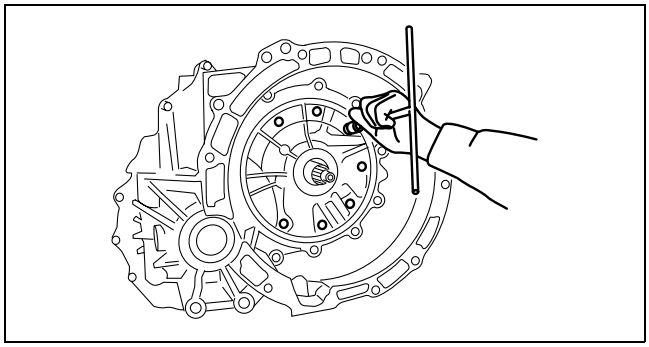
D6J517ZA4012

32. Remove the band servo component.



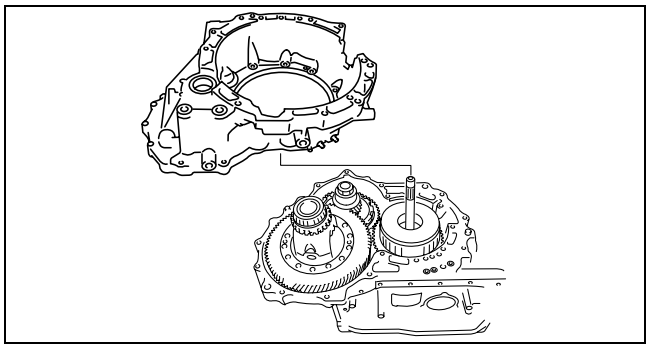
D6E517ZA5014

33. Remove the oil pump.



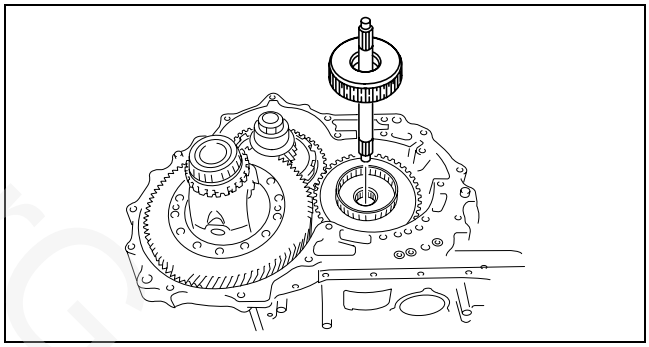
D6J517ZA4014

34. Remove the converter housing by tapping lightly with a plastic hammer.



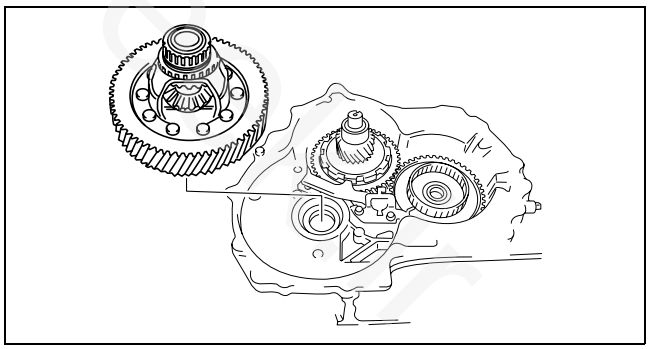
D6J517ZA4015

35. Remove the forward clutch component.



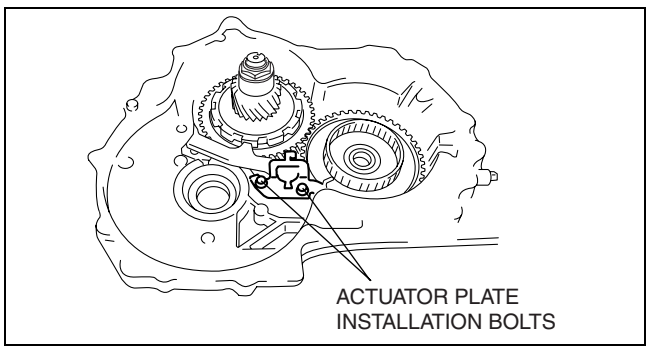
D6J517ZA4016

36. Remove the differential.



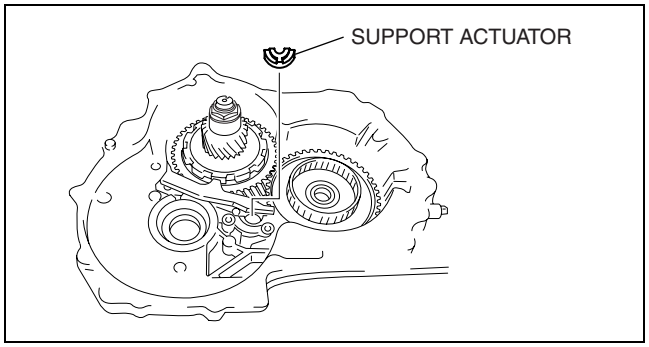
D6J517ZA4017

37. Remove the actuator plate.



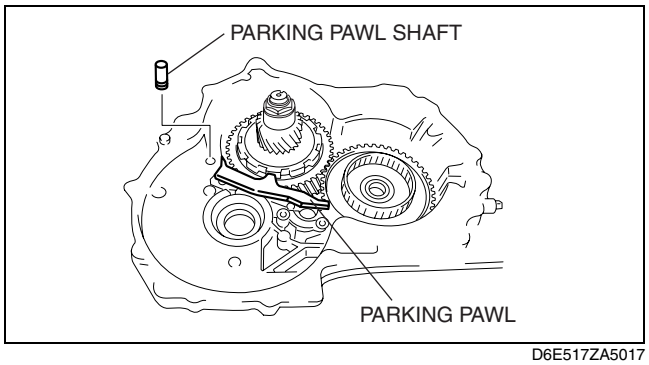
D6E517ZA5015

38. Remove the support actuator.



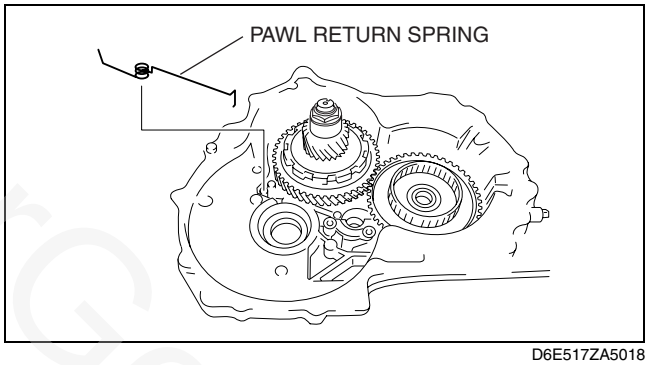
D6E517ZA5016

39. Pull out the parking pawl shaft.
40. Remove the parking pawl.



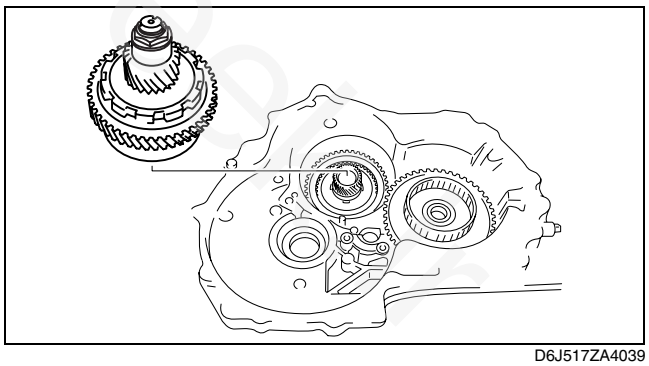
D6E517ZA5017

41. Remove the pawl return spring.



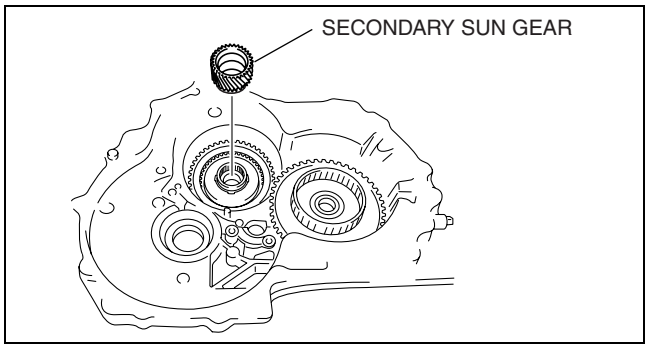
D6E517ZA5018

42. Remove the Output gear component.



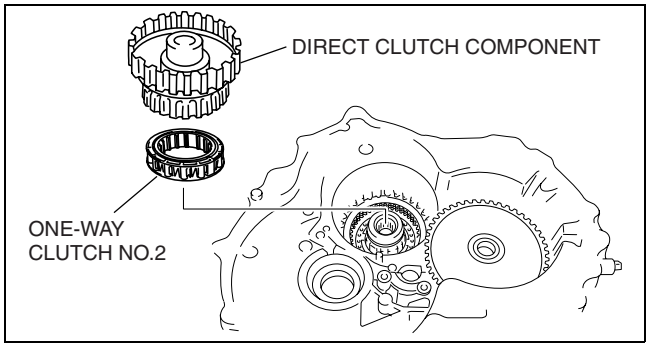
D6J517ZA4039

43. Remove the Secondary sun gear.



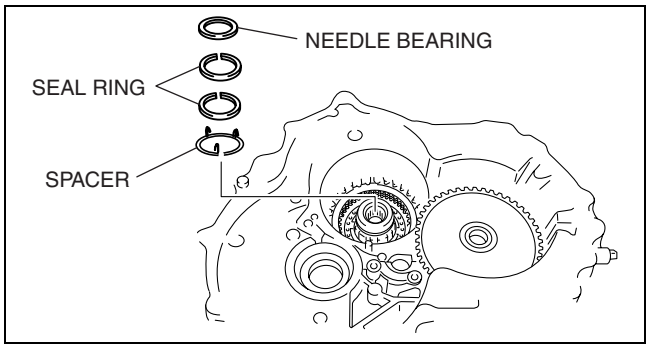
D6E517ZA5019

44. Remove the direct clutch component and one-way clutch No.2.



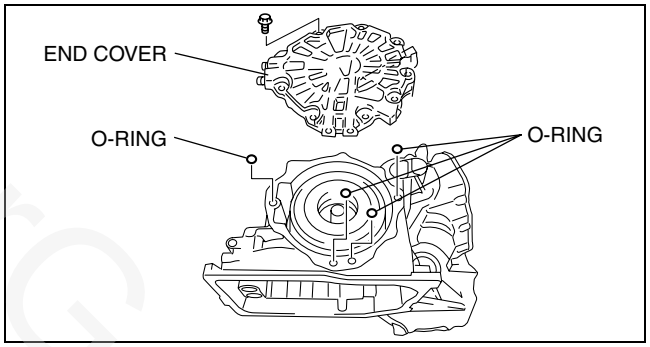
D6E517ZA5020

45. Remove the Needle bearing, seal rings and spacer.
46. Remove the reduction brake.(See 05–17–46 REDUCTION BRAKE DISASSEMBLY/ ASSEMBLY.)



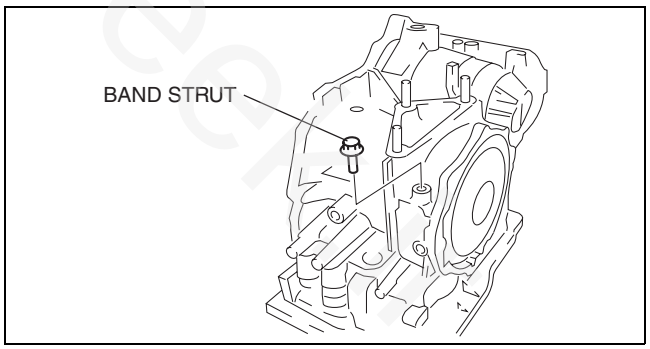
D6E517ZA5021

47. Remove the end cover.
48. Remove the O-rings from the transaxle case.



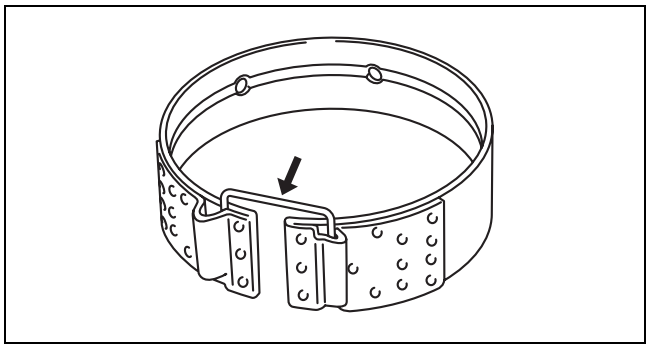
D6E517ZA5022

49. Remove the band strut.



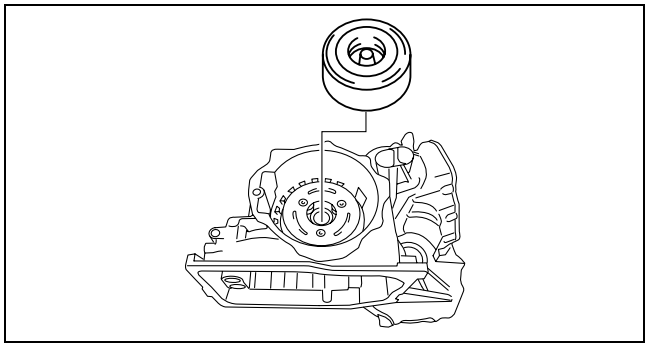
D6E517ZA5023

50. Remove the 2–4 brake band, and hold it together using a piece of wire as shown in the figure.



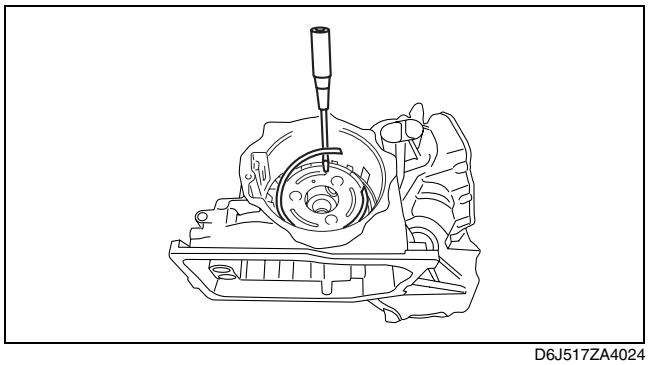
B3E0517A223

51. Remove the clutch component.



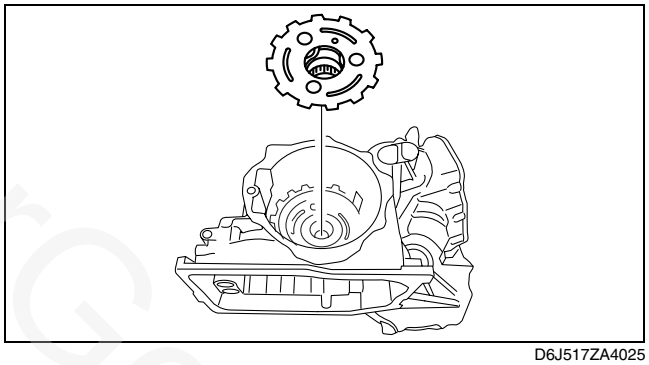
D6J517ZA4023

52. Remove the snap ring.



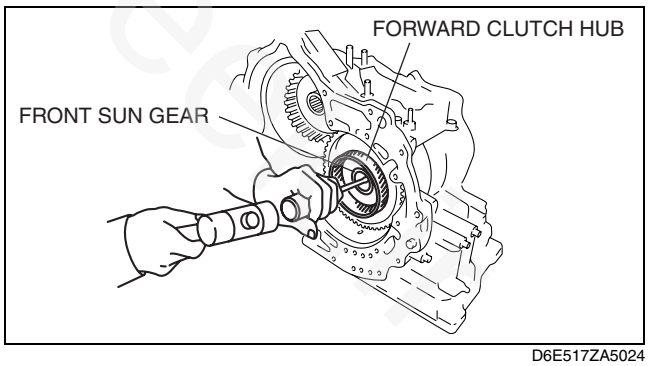
D6J517ZA4024

53. Remove the rear planetary gear component.



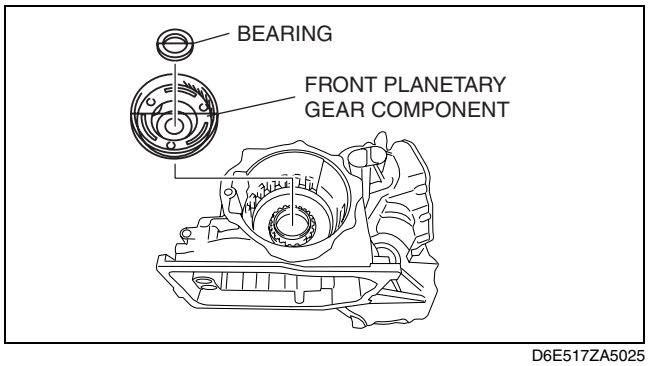
D6J517ZA4025

54. Remove the front sun gear by tapping its end with a flathead screwdriver or similar tool. as shown in the figure.
55. Remove the forward clutch hub.



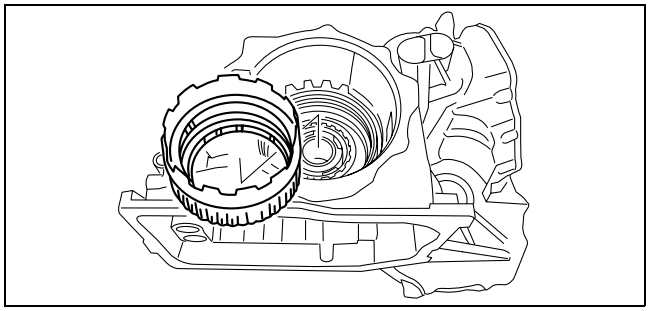
D6E517ZA5024

56. Remove the front planetary gear component.



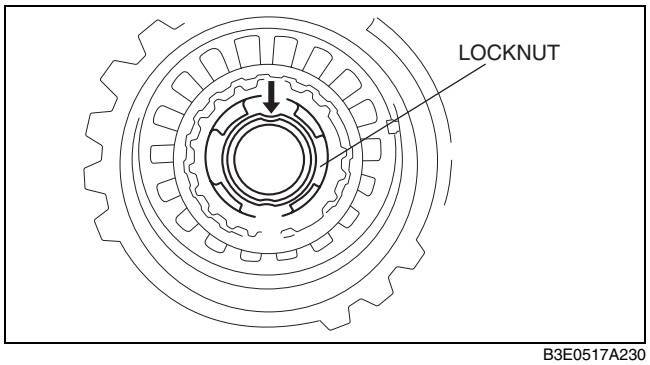
D6E517ZA5025

57. Remove the front internal gear and one-way clutch component.



D6J517ZA4028

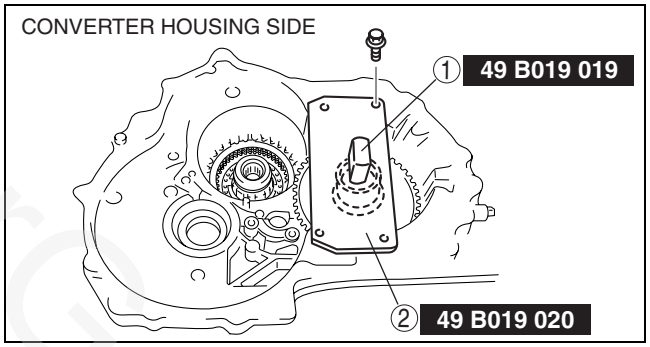
58. Remove the locknut.
    (1) Knock the crimped portion of the locknut outward by using a small chisel and a hammer.



B3E0517A230

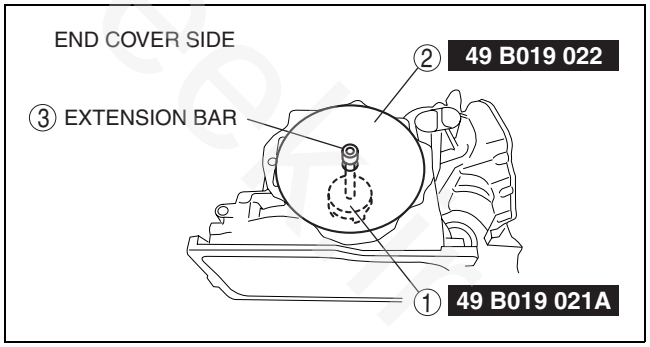
    (2) Install the **SST** to the primary gear in the order shown.

Tightening torque
19—25 N·m {1.9—2.6 kgf·m, 14—18 ft·lbf}



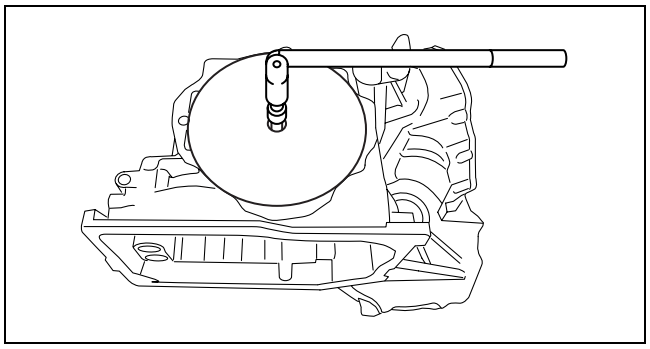
D6E517ZA5026

    (3) Install the **SST** to the locknut in the order shown.



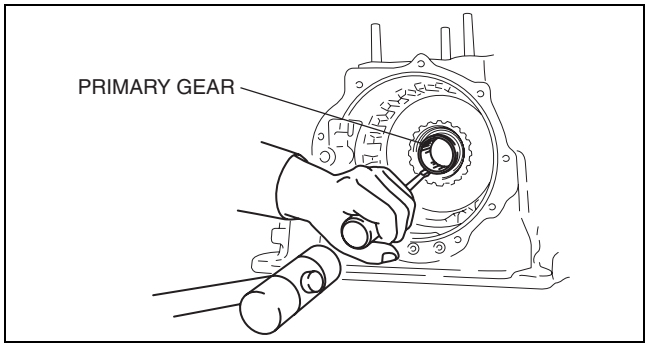
D6E517ZA5027

    (4) Remove the locknut.



D6J517ZA4030

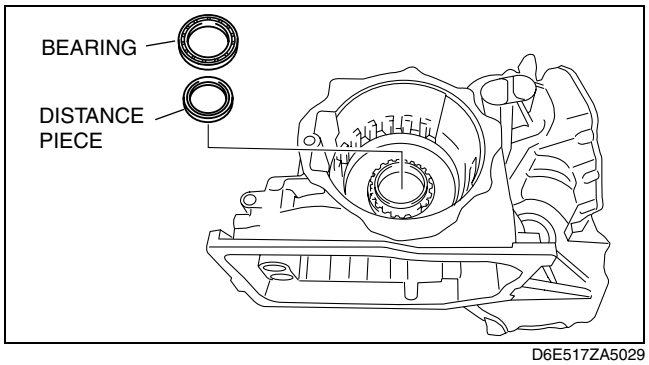
59. Remove the primary gear by tapping it with a flathead screwdriver, etc. as shown in the figure.



D6E517ZA5028

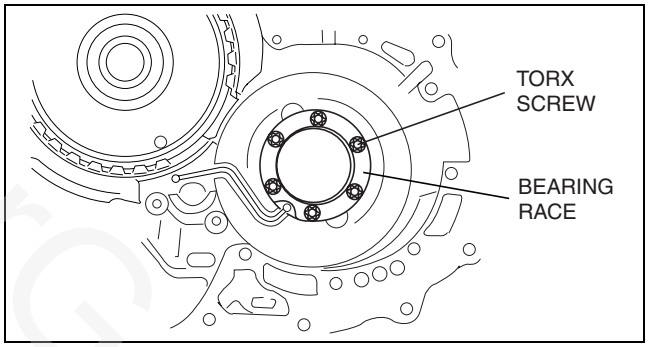
60. Remove the bearing and distance piece.

Caution
- **Removing the bearing race using a flathead screwdriver can damage the inside of the bearing race. Handle the flathead screwdriver carefully.**



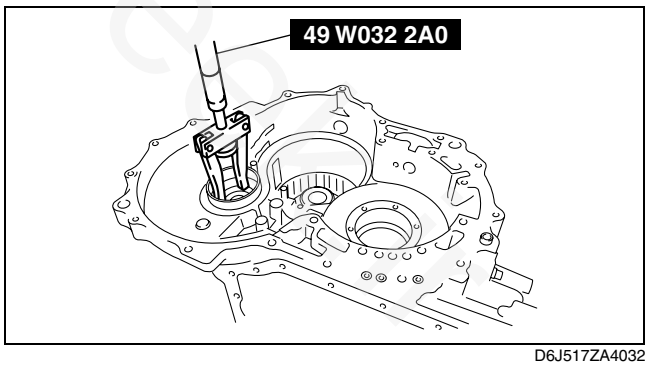
D6E517ZA5029

61. Remove torx screws from the converter housing side.
62. Remove the bearing race.



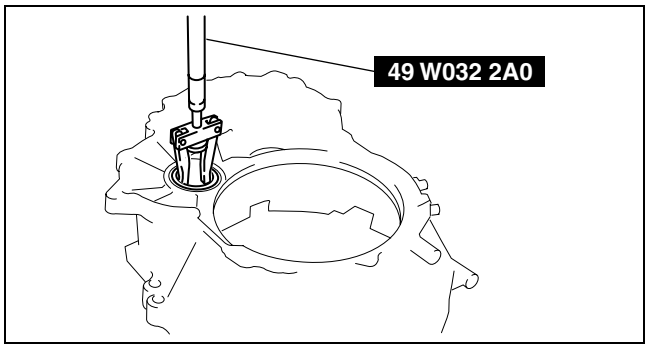
D6E517ZA5030

63. Remove the bearing race using the **SST** as shown in the figure.



D6J517ZA4032

64. Remove the bearing using the **SST** as shown in the figure.



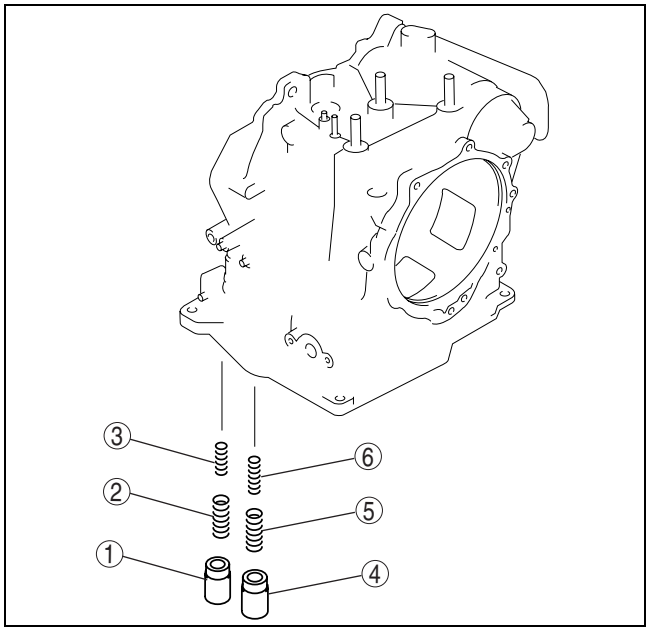
D6J517ZA4175

ACCUMULATORS DISASSEMBLY/ASSEMBLY

E6U051721272A01

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

1	Servo apply accumulator
2	Servo apply accumulator large spring
3	Servo apply accumulator small spring
4	Forward accumulator
5	Forward accumulator large spring
6	Forward accumulator small spring



D6J517ZA4090

Assembly Procedure

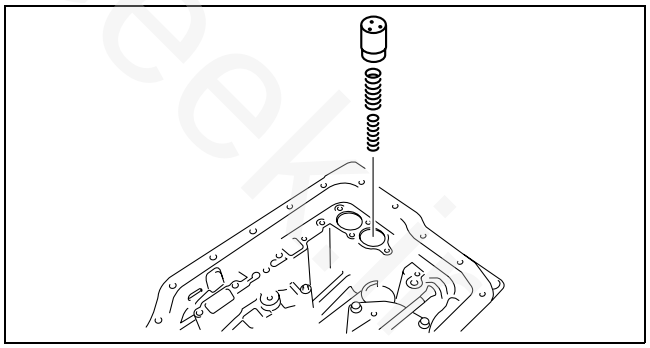
1. Measure the spring free length.

Accumulator spring (standard)

Spring	Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
Servo apply accumulator large spring	21.0 {0.827}	67.8 {2.669}	10.3	3.5 {0.138}
Servo apply accumulator small spring	13.0 {0.512}	67.8 {2.669}	17.1	2.2 {0.087}
Forward accumulator large spring	21.0 {0.827}	75.0 {2.953}	10.7	2.3 {0.091}
Forward accumulator small spring	15.6 {0.614}	49.0 {1.929}	7.7	2.4 {0.094}

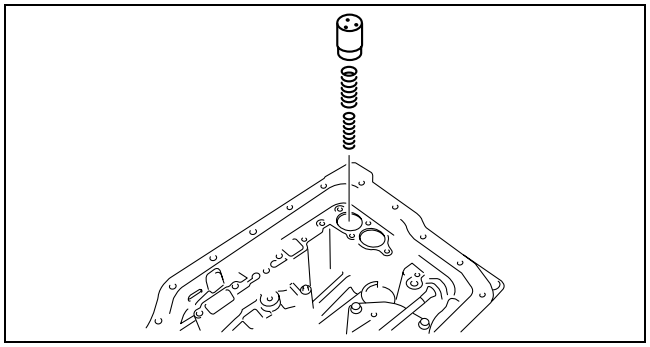
- If not as specified, replace the spring.

2. Install the forward accumulator small spring, forward accumulator large spring and forward accumulator.



D6J517ZA4091

3. Install the servo apply accumulator small spring, servo apply accumulator large spring and servo apply accumulator.

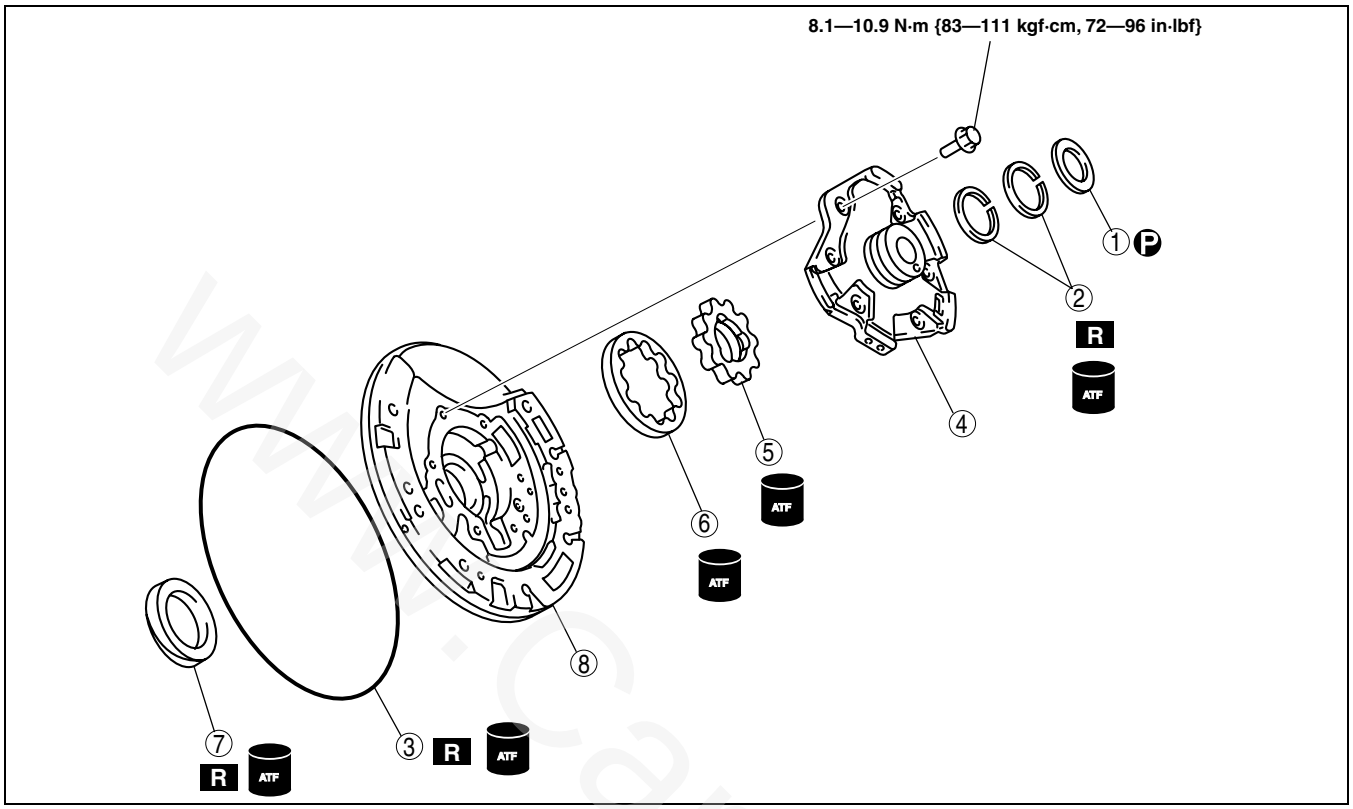


D6J517ZA4092

OIL PUMP DISASSEMBLY/ASSEMBLY

E6U051719220A04

1. Perform the preinspection before disassembly. (See 05–17–106 Oil Pump Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

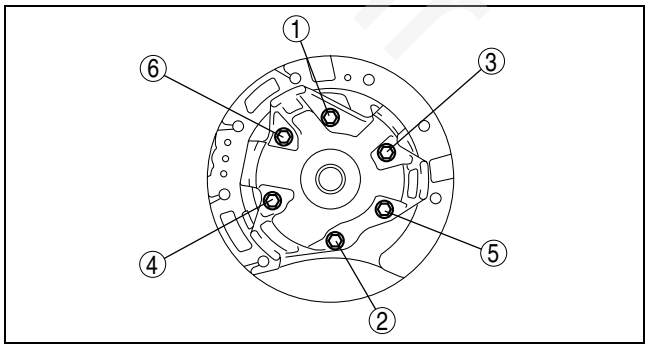


D6E517ZA5031

1	Thrust washer
2	Seal rings
3	O-ring
4	Oil pump cover (See 05–17–18 Oil Pump Cover Disassembly Note.)
5	Inner rotor (See 05–17–19 Inner Rotor, Outer Rotor Disassembly Note.)
6	Outer rotor (See 05–17–19 Inner Rotor, Outer Rotor Disassembly Note.)
7	Oil seal
8	Oil pump housing

Oil Pump Cover Disassembly Note

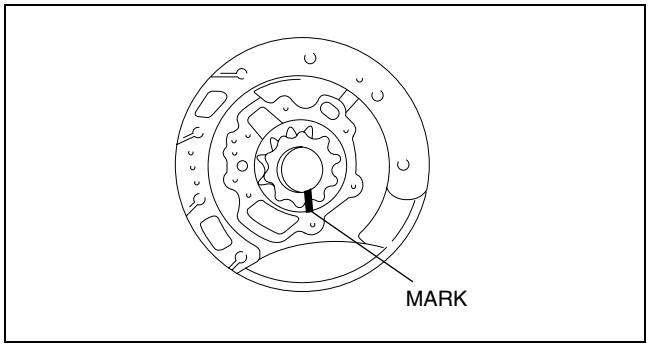
- Loosen the mounting bolts evenly in the pattern shown and remove the oil pump cover from the oil pump housing.



D6J517ZA4129

Inner Rotor, Outer Rotor Disassembly Note

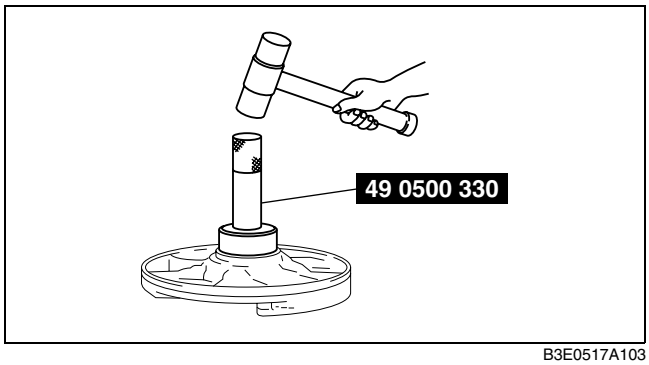
- Mark the outer and inner rotors without scratching or denting them, then remove the oil pump housing.



B3E0517A102

Assembly Procedure

1. Apply ATF to new oil seal and install it onto oil pump housing using the **SST**.

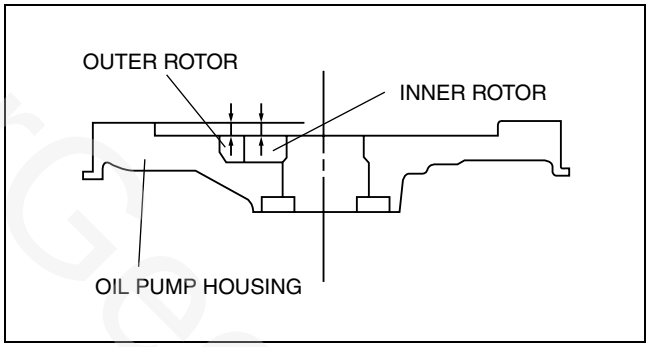


B3E0517A103

2. Measure the clearance between the end of the oil pump housing and the outer rotor and inner rotor at four places along their circumferences.

   Clearance between the end of the oil pump housing and the outer rotor and inner rotor
   Standard: 0.04—0.05 mm {0.0016—0.0019 in}
   Maximum: 0.05 mm {0.002 in}

   - If not as specified, replace the oil pump.

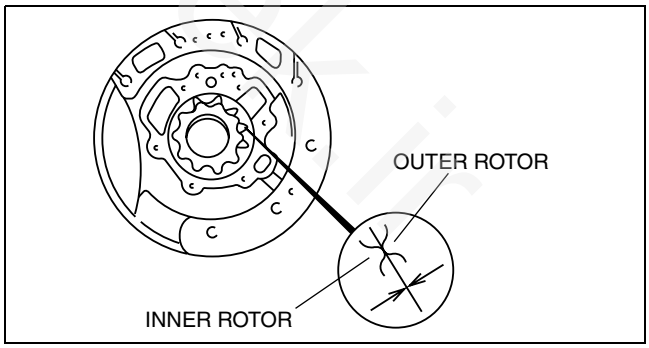


B3E0517A104

3. Measure the clearance between the outer rotor and the inner rotor.

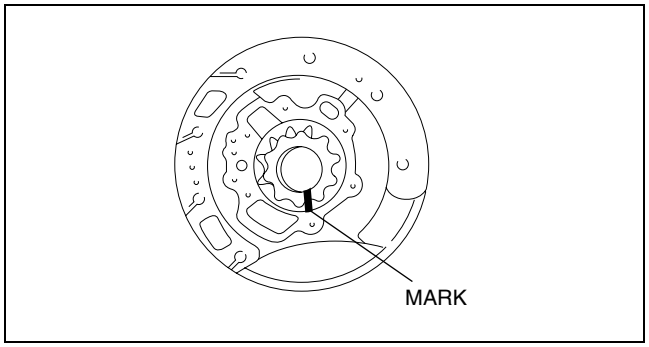
   Clearance between the outer rotor and the inner rotor
   Standard: 0.02—0.11 mm {0.0008—0.0043 in}
   Maximum: 0.12 mm {0.0047 in}

   - If not within the specification, replace the oil pump.
4. Apply ATF to the outer and inner rotors.
5. Align the marks and install the outer and inner rotors.



B3E0517A105

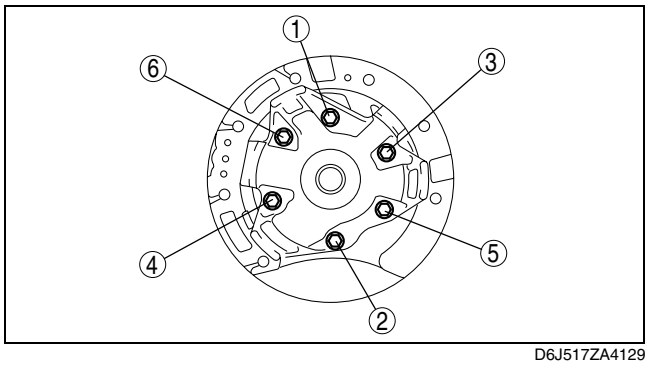
6. Install the oil pump flange.
7. Mount the oil pump cover onto the oil pump housing.



B3E0517A102

8. Tighten the bolts evenly and gradually in the order shown.

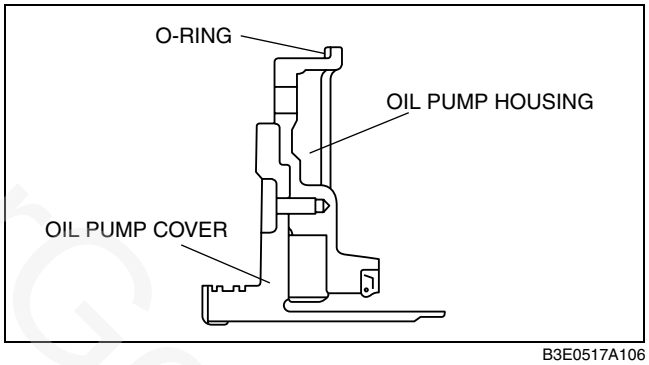
Tightening torque
8.1—10.9 N·m {83—111 kgf·cm, 72—96 in·lbf}



D6J517ZA4129

9. Apply ATF to new O-ring and install it onto the oil pump housing.

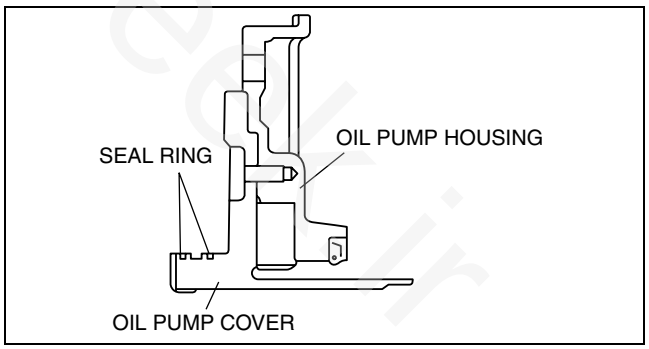
O-ring inner diameter
209.5 mm {8.248 in}



B3E0517A106

10. Apply ATF to new seal rings and install them onto the oil pump cover.

Seal ring inner diameter
47.1 mm {1.854 in}

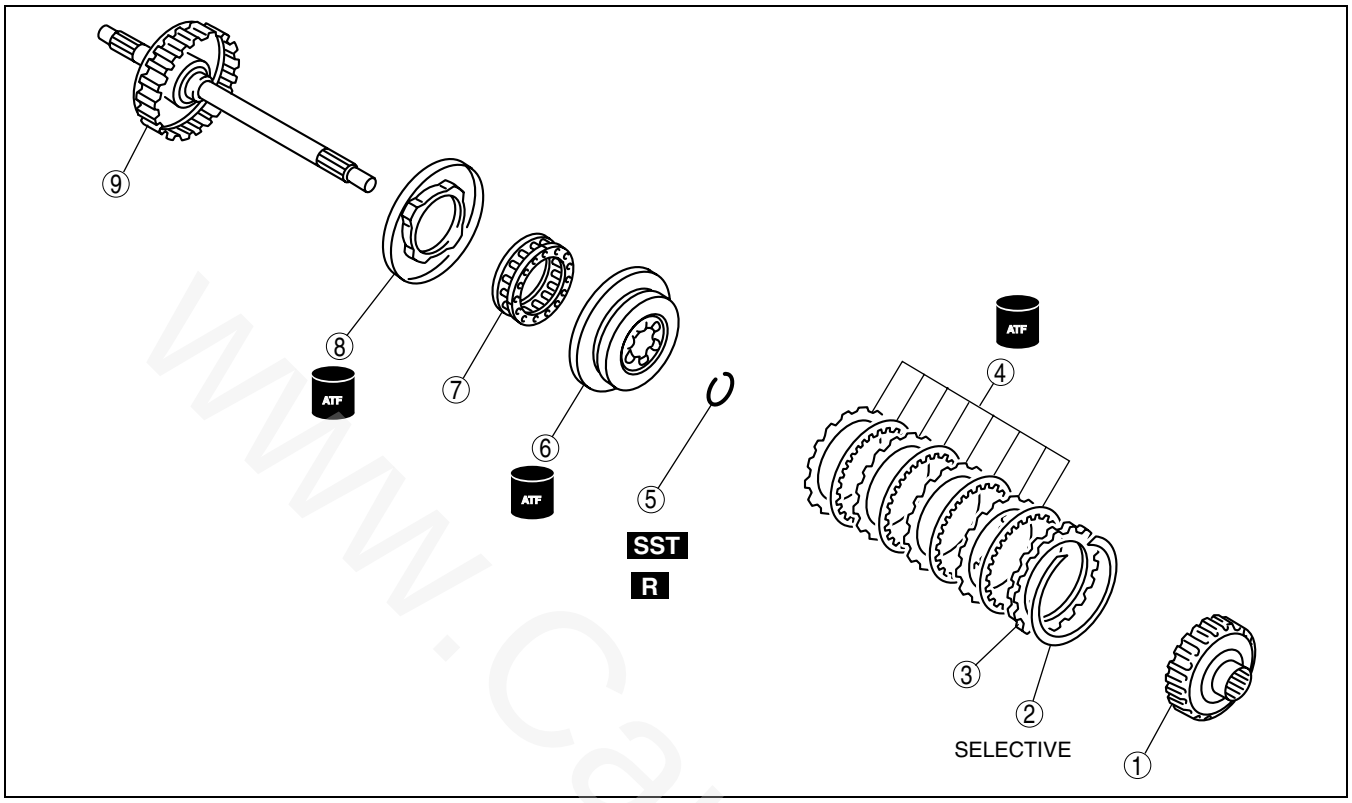


B3E0517A107

FORWARD CLUTCH DISASSEMBLY/ASSEMBLY

E6U051719500A13

1. Perform the preinspection before disassembly.
   (See 05–17–107 Forward Clutch Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.



B3E0517A108

1	Forward clutch hub
2	Snap ring
3	Retaining plate
4	Drive and driven plate
5	Snap ring (See 05–17–21 Snap Ring Disassembly Note.)

6	Seal plate
7	Springs and retainer component
8	Forward clutch piston (See 05–17–22 Forward Clutch Piston Disassembly Note.)
9	Forward clutch drum and turbine shaft

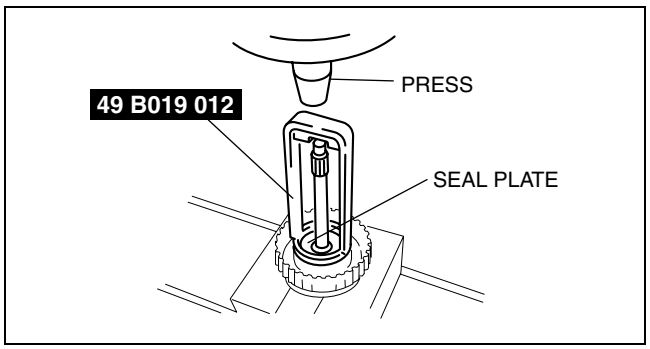
Snap Ring Disassembly Note

1. Install the **SST** to the forward clutch.

Caution

- **Depress the seal plate only enough to remove the snap ring. Overpressing will damage the seal plate assembly edges.**

2. Compress the seal plate.
3. Remove the snap ring.
4. Remove the **SST,** then remove the seal plate and spring and retainer component.

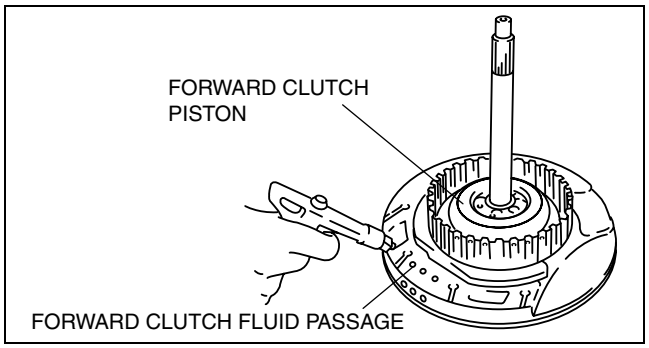


B3E0517A109

Forward Clutch Piston Disassembly Note

1. Set the forward clutch drum and turbine shaft onto the oil pump.
2. Remove the forward clutch piston by applying compressed air through the fluid passage.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.



B3E0517A110

Assembly Procedure

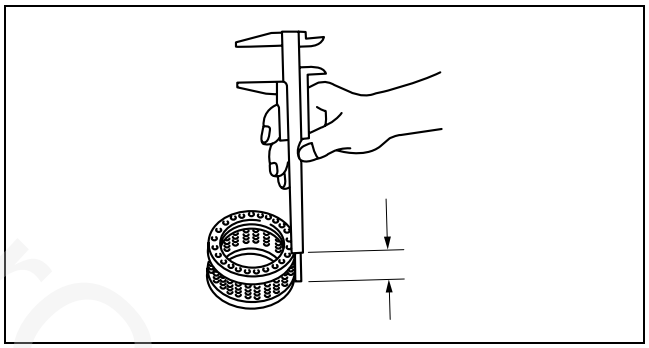
1. Measure the facing thickness in three places, and calculate the average value.

   Forward clutch drive plate thickness
   Standard: 1.60 mm {0.063 in}
   Minimum: 1.45 mm {0.057 in}

   - If not within the specification, replace the drive plates.
2. Measure the spring free length.

   Forward clutch springs and retainer component free length
   Standard: 17.2 mm {0.677 in}
   Minimum: 15.2 mm {0.598 in}

   - If not within the specification, replace the spring and retainer component.



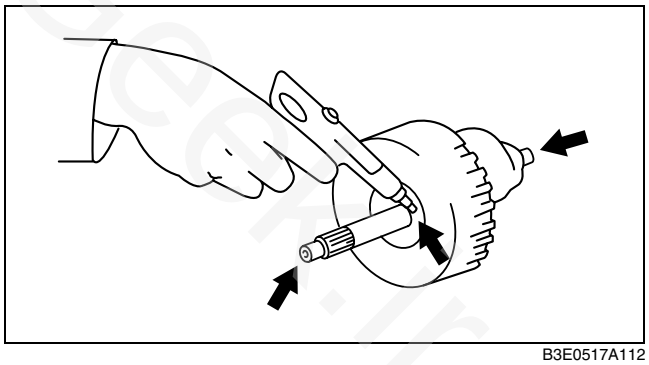
B3E0517A111

3. Verify that there is airflow when applying compressed air through the fluid passage.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

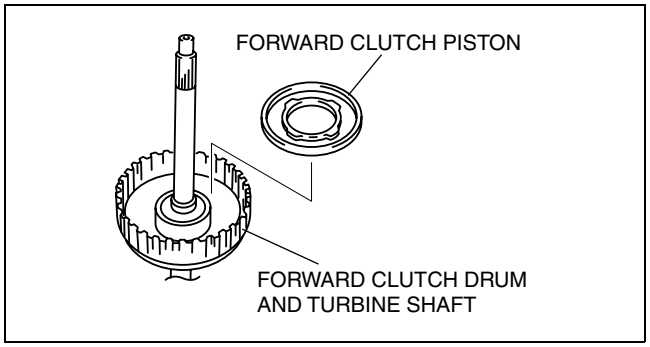
4. Replace the forward clutch drum and turbine shaft if damaged or malfunctioning.

   Caution
   - **Installing the forward clutch piston may damage its seal. Carefully install the forward clutch piston by pushing evenly around the circumference.**



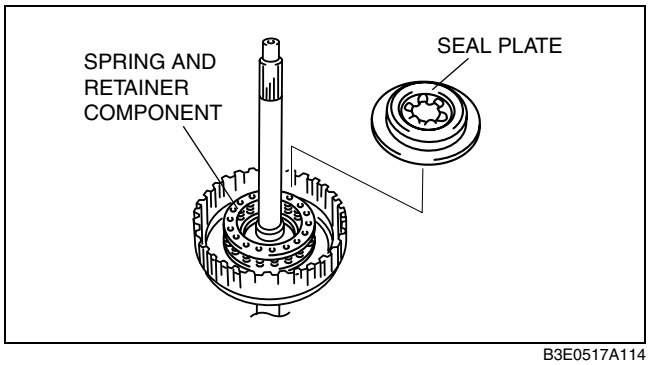
B3E0517A112

5. Apply ATF to the circumference of the forward clutch piston seal, and install the piston into the forward clutch drum and turbine shaft.
6. Install the spring and retainer component.



B3E0517A113

7. Apply ATF to the seal plate, and install it onto the forward clutch drum.



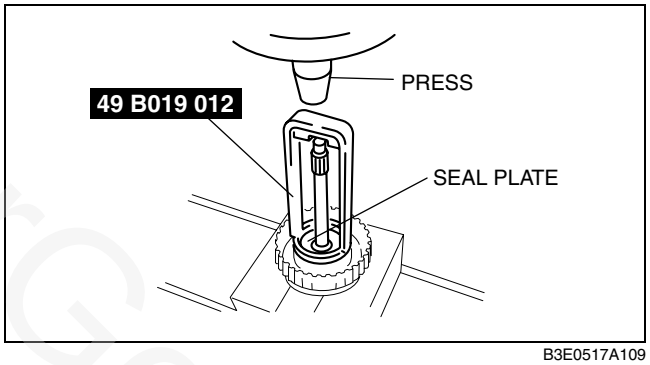
B3E0517A114

8. Install the **SST** to the forward clutch drum and turbine shaft as shown.

Caution

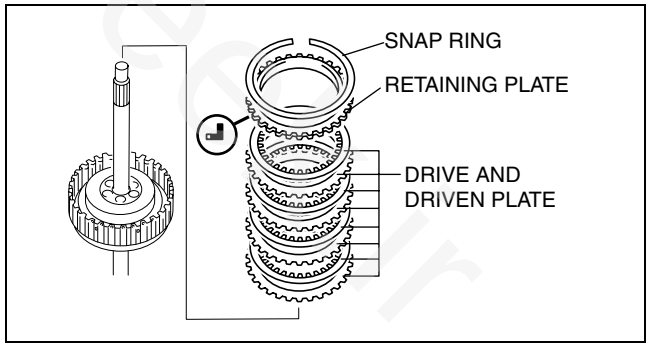
- **Depress the seal plate only enough to remove the snap ring. Overpressing will damage the seal plate assembly edges.**

9. Compress the seal plate.
10. Install the snap ring.
11. Remove the **SST**.



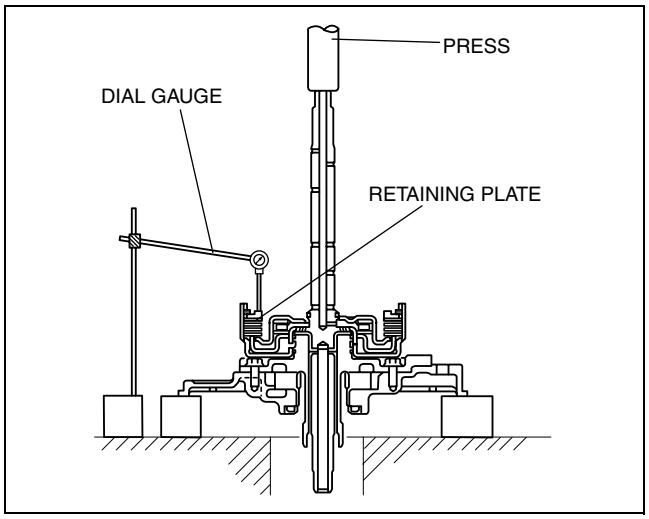
B3E0517A109

12. Install the drive and driven plates in the following order.
    Driven—Drive—Driven—Drive—Driven—Drive—Driven—Drive
13. Install the retaining plate.
14. Install the snap ring.



B3E0517A115

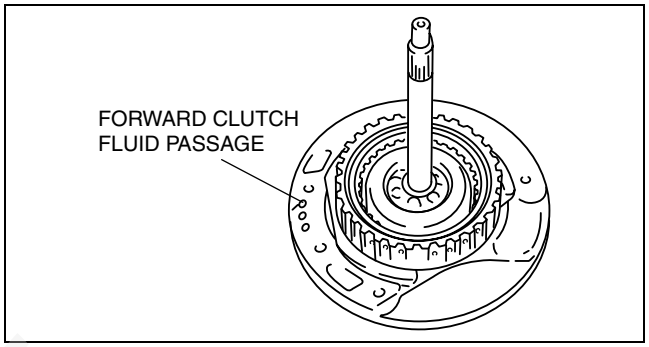
15. Measure the forward clutch clearance.
    (1) Install the forward clutch in the oil pump, and set the dial gauge.
    (2) Secure the forward clutch by lightly pressing down with a press or similar tool.



B3E0517A116

    (3) Apply compressed air to the part indicated in the figure and let the forward clutch piston stroke three times.

Air pressure
392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}



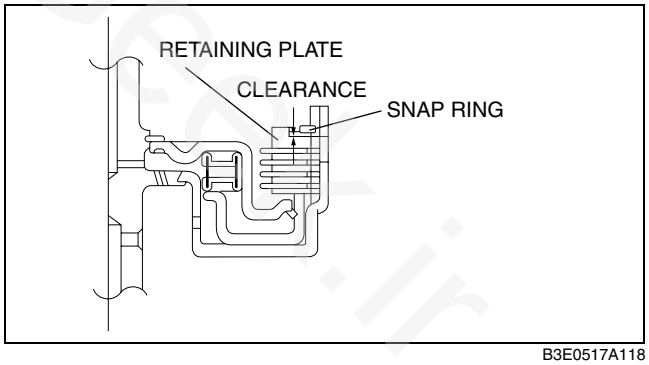
B3E0517A117

    (4) Apply compressed air and operate the forward clutch piston. Read the value when the indicator of the dial gauge stops.
    (5) Release the compressed air and read the dial gauge when the forward clutch piston is not operating.
    (6) Calculate the forward clutch clearance according to the following formula:
    Step (4) value— Step (5) value= Forward clutch clearance.
    (7) Measure the clearances at four locations (90° apart) by following the steps (3) to (6).
    Verify that the average value is within the specification below:

Forward clutch clearance
Standard: 1.50—1.80 mm {0.059—0.070 in}

- If not as specified, remove the snap ring and measure its thickness.

    (8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.



B3E0517A118

Snap ring size for forward clutch clearance

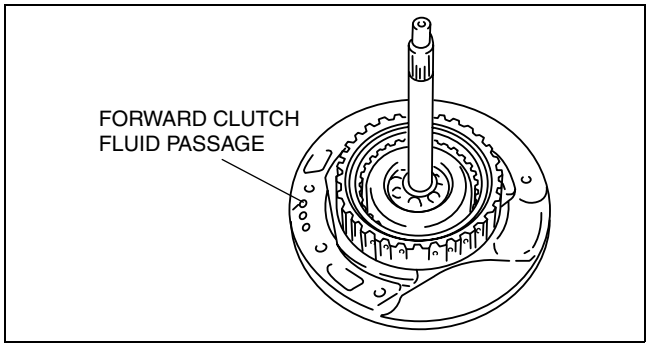
Range mm {in}	Snap ring sizes mm {in}
2.810—3.010 {0.111—0.118}	1.2 {0.047}
3.010—3.210 {0.119—0.126}	1.4 {0.055}
3.210—3.410 {0.127—0.134}	1.6 {0.063}
3.410—3.610 {0.135—0.142}	1.8 {0.071}
3.610—3.810 {0.143—0.150}	2.0 {0.079}
3.810—4.010 {0.150—0.157}	2.2 {0.087}

    (9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.

16. Inspect the forward clutch operation.
    (1) Install the forward clutch drum and turbine shaft to the oil pump.
    (2) Inspect the forward clutch operation by applying compressed air as shown.

    Air pressure
    392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}

17. Install the forward clutch hub.

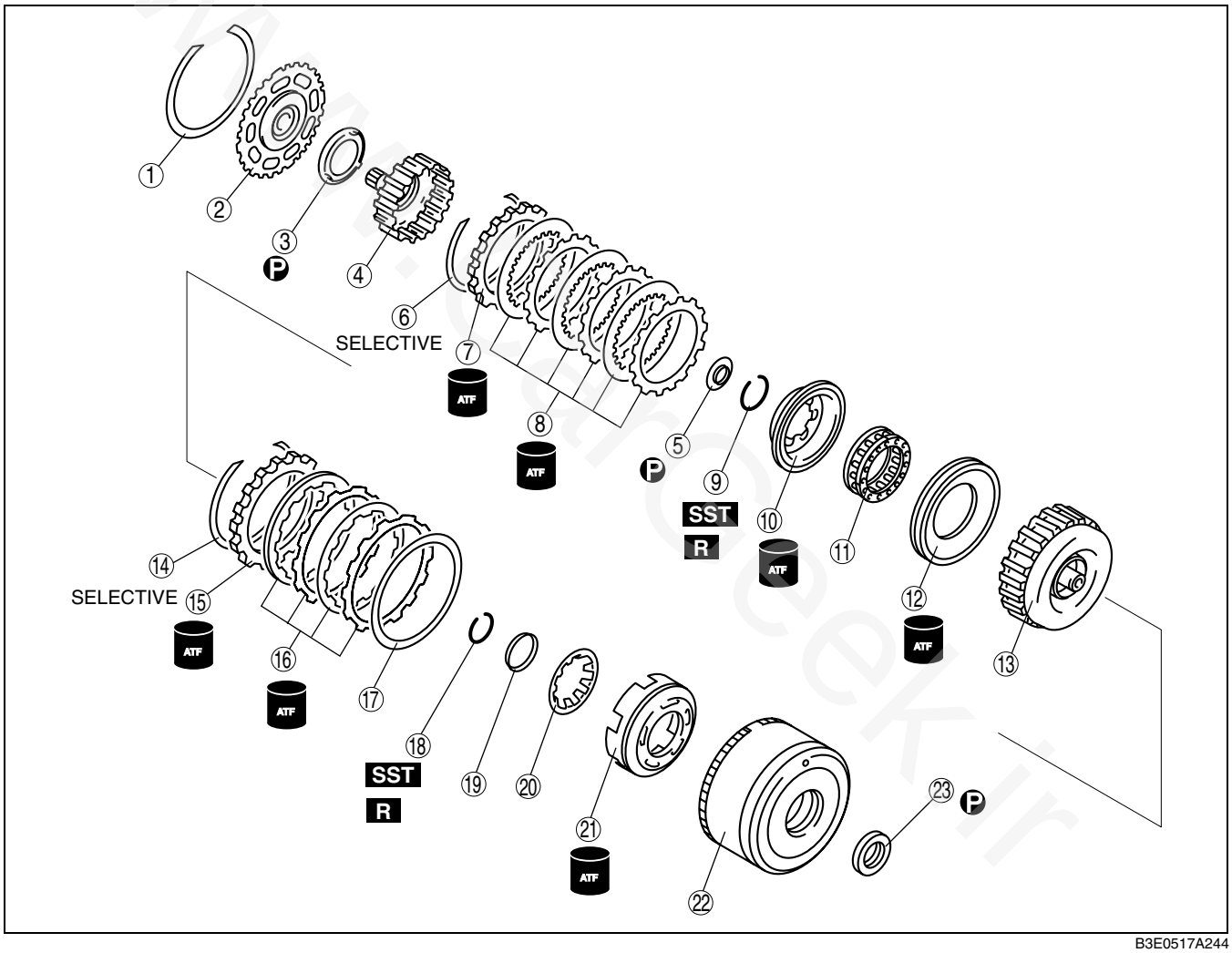


B3E0517A117

CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY

E6U051719500A14

1. Perform the preinspection before disassembly. (See 05–17–108 Clutch Component Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.



B3E0517A244

1	Snap ring
2	Rear sun gear plate
3	Bearing
4	3–4 clutch hub
5	Bearing
6	Snap ring
7	Retaining plate
8	Drive and driven plate

9	Snap ring (See 05–17–26 Snap Ring (3–4 clutch) Disassembly Note.)
10	Seal plate
11	Spring and retainer component
12	3–4 clutch piston (See 05–17–26 3–4 Clutch Piston Disassembly Note.)
13	3–4 clutch drum
14	Snap ring

15	Retaining plate
16	Drive and driven plate
17	Dish plate
18	Snap ring (See 05–17–27 Snap Ring (Reverse clutch) Disassembly Note.)

19	Reverse return stopper
20	Piston return spring
21	Reverse piston (See 05–17–27 Reverse Piston Disassembly Note.)
22	2–4 brake drum
23	Bearing

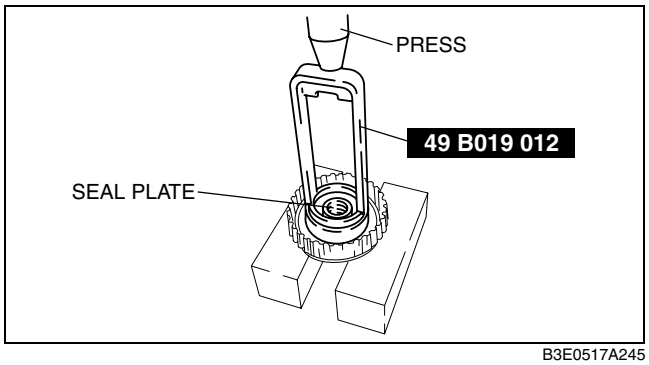
Snap Ring (3–4 clutch) Disassembly Note

1. Install the **SST** as shown.

Caution

- **Depress the seal plate only enough to remove the snap ring. Overpressing will damage the seal plate assembly edges.**

2. Compress the seal plate.
3. Remove the snap ring.
4. Remove the **SST**, then remove the seal plate and spring and retainer component.

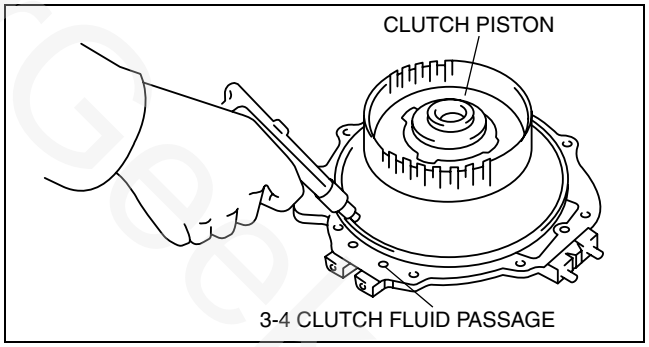


B3E0517A245

3–4 Clutch Piston Disassembly Note

1. Set the 3–4 clutch drum onto the end cover.
2. Remove the 3–4 clutch piston from the 3–4 clutch drum by applying compressed air through the fluid passage.

Air pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.



B3E0517A246

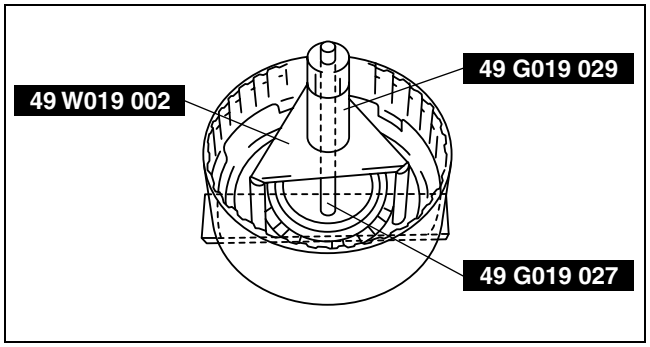
Snap Ring (Reverse clutch) Disassembly Note

1. Install the **SSTs** as shown.

Caution

- **Depress the piston return spring only enough to remove the snap ring. Overpressing will damage the piston return spring assembly edges.**

2. Compress the piston return spring.
3. Remove the snap ring.
4. Remove the **SSTs**, then remove the reverse return stopper and return spring.

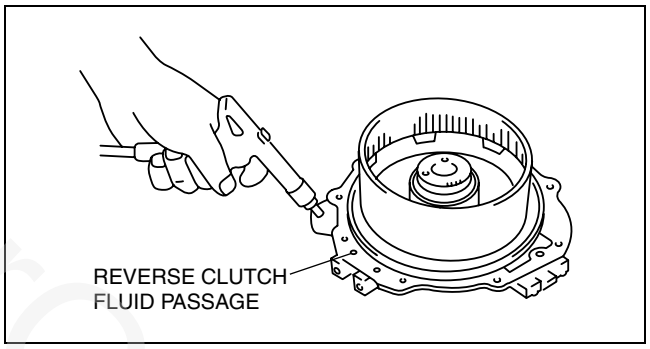


D6J517ZA4195

Reverse Piston Disassembly Note

1. Set the 2–4 brake drum onto the end cover.
2. Remove the reverse piston from the 2–4 brake drum by applying compressed air through the fluid passage.

Air pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.



B3E0517A248

Assembly Procedure

1. Measure the facing thickness in three places and calculate the average value.

Reverse clutch drive plate thickness
Standard: 1.60 mm {0.063 in}
Minimum: 1.45 mm {0.057 in}

3-4 clutch drive plate thickness
Standard: 2.55 mm {0.100 in}
Minimum: 2.40 mm {0.094 in}

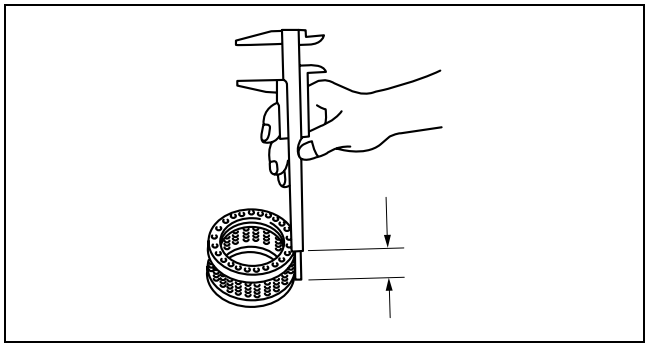
3-4 clutch driven plate thickness
Standard: 2.55 mm {0.100 in}
Minimum: 2.40 mm {0.094 in}

- If not within the specification, replace the drive plates.

2. Measure the free length of the spring and inspect for deformation.

   3-4 clutch springs and retainer component free length
   Standard: 17.2 mm {0.677 in}
   Minimum: 15.2 mm {0.598 in}

   - If not within the specification, replace the spring and retainer.

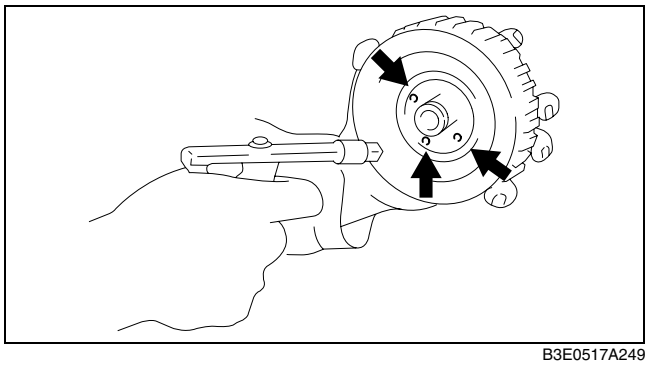


B3E0517A111

3. Verify that there is airflow when applying compressed air through the fluid passage of 3–4 clutch drum.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

4. Replace the 3–4 clutch drum if damaged or malfunctioning.

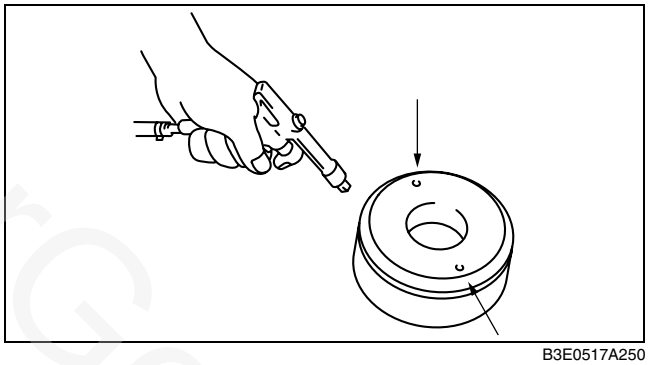


B3E0517A249

5. Verify that there is airflow when applying compressed air through the fluid passage of 2–4 brake drum.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

6. Replace the 2–4 brake drum if damaged or malfunctioning.

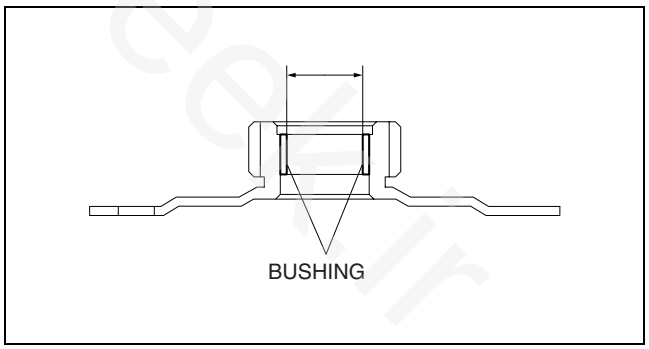


B3E0517A250

7. Measure the bushing of the rear sun gear.

   Rear sun gear bushing inner diameter
   Standard: 29.900—29.921 mm {1.17717—1.17799 in}
   Maximum: 29.941 mm {1.17878 in}

   - If not as specified, replace the rear sun gear plate.

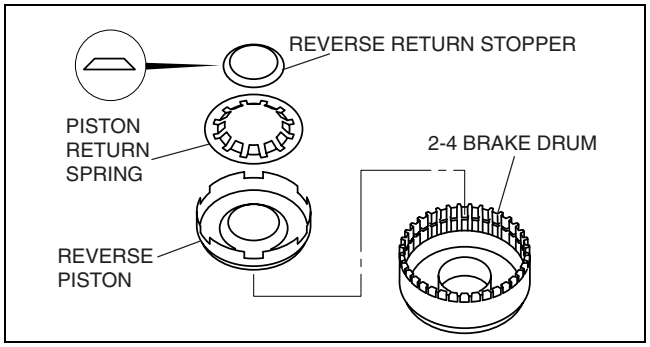


B3E0517A251

8. Install the reverse clutch.

Caution
- **Installing the reverse clutch piston may damage its seal. Carefully install the reverse clutch piston by pushing evenly around the circumference.**

(1) Apply ATF to the circumference of the reverse clutch piston seal, and install the piston into the 2–4 brake drum.
(2) Install the piston return spring and reverse return stopper to the reverse piston.

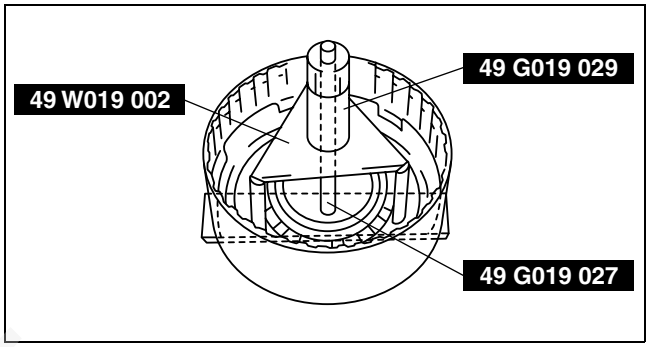


B3E0517A252

(3) Install the snap ring and the **SSTs** to the 2–4 brake drum as shown.

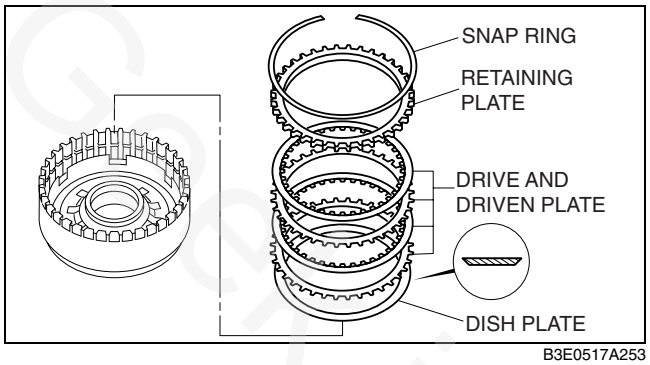
Caution
- **Depress the piston return spring only enough to install the snap ring. Overpressing will damage the piston return spring assembly edges.**

(4) Compress the piston return spring.
(5) Install the snap ring.
(6) Remove the **SSTs**.



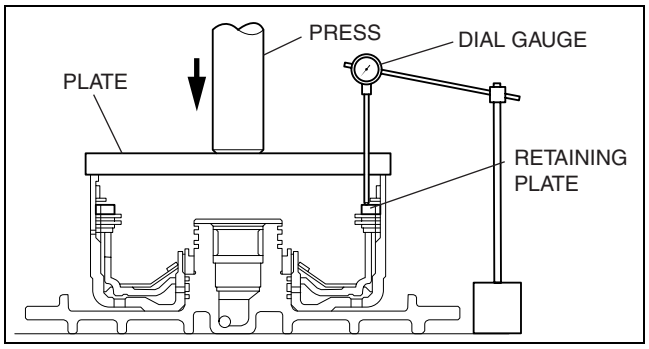
D6J517ZA4195

(7) Install the dish plate.
(8) Install the drive and driven plates in the following order.
Driven—Drive—Driven—Drive
(9) Install the retaining plate.



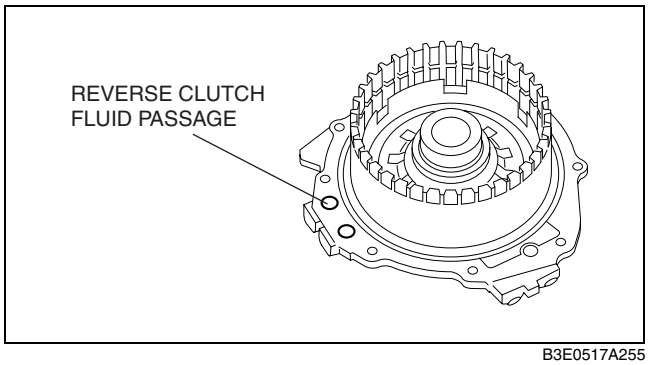
B3E0517A253

9. Measure the reverse clutch clearance.
   (1) Install the reverse clutch into the end cover, and set the dial gauge.
   (2) Secure the reverse clutch by lightly pressing down with a press or similar tool.



B3E0517A254

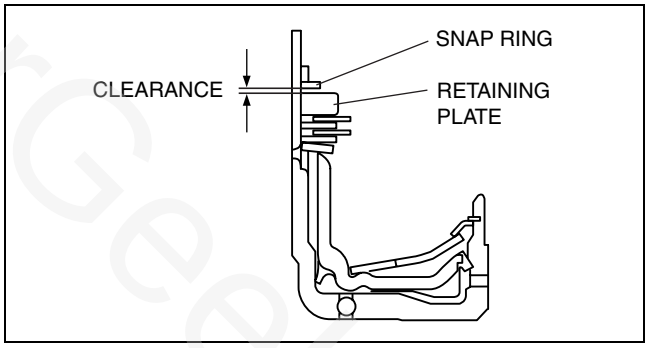
   (3) Apply compressed air to the part indicated in the figure and let the reverse clutch piston stroke three times.



B3E0517A255

Air pressure
392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}

   (4) Apply compressed air and operate the reverse clutch piston. Read the value when the indicator of the dial gauge stops.
   (5) Release the compressed air and read the dial gauge when the reverse clutch piston is not operating.
   (6) Calculate the reverse clutch clearance according to the following formula:
   step (4) value – step (5) value = Reverse clutch clearance.
   (7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.



D6E517ZA5106

Reverse clutch clearance
Standard: 1.00—1.30 mm {0.039—0.051 in}

- If not within the specification, remove the snap ring and measure its thickness.

   (8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.

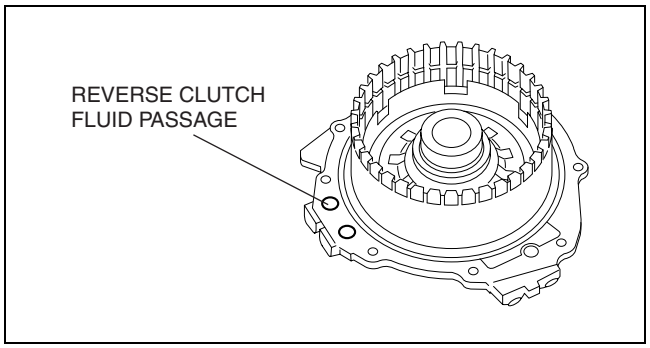
Snap ring size for reverse clutch clearance

Range mm {in}	Snap ring sizes mm {in}
2.370—2.570 {0.094—0.101}	1.2 {0.047}
2.570—2.770 {0.102—0.109}	1.4 {0.055}
2.770—2.970 {0.110—0.116}	1.6 {0.063}
2.970—3.170 {0.117—0.124}	1.8 {0.071}
3.170—3.370 {0.125—0.132}	2.0 {0.079}
3.370—3.570 {0.133—0.140}	2.2 {0.087}

   (9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.

10. Inspect the reverse clutch operation.
    (1) Install the 2–4 brake drum to the end cover.
    (2) Inspect the reverse clutch operation by applying compressed air as shown.

Air pressure
392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}

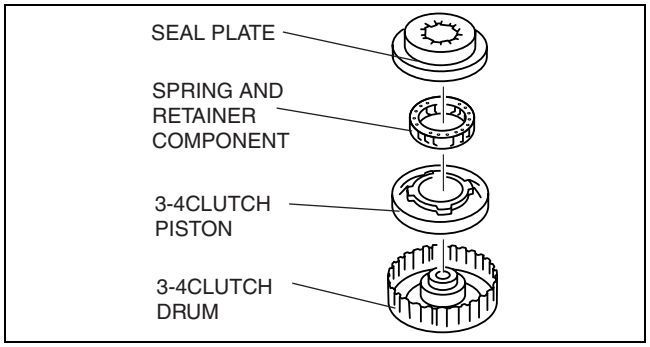


B3E0517A255

11. Install the 3–4 clutch.

Caution
- **Installing the 3-4 clutch piston may damage its seal. Carefully install the 3–4 clutch piston by pushing evenly around the circumference.**

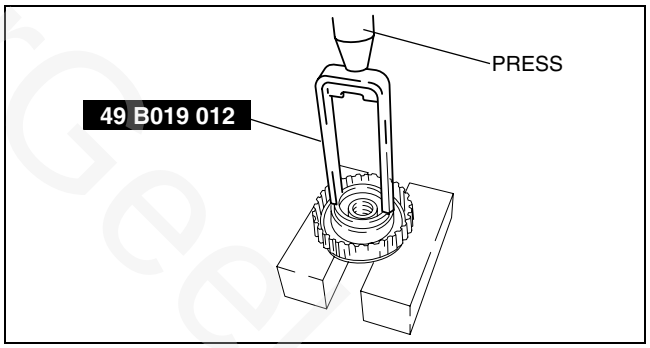
(1) Apply ATF to the circumference of the 3–4 clutch piston seal, and install the piston in to the 3–4 clutch drum.
(2) Install the spring and retainer.
(3) Apply ATF to the 3–4 seal plate, and install it onto the 3–4 clutch drum.



B3E0517A257

(4) Install the **SST** as shown.

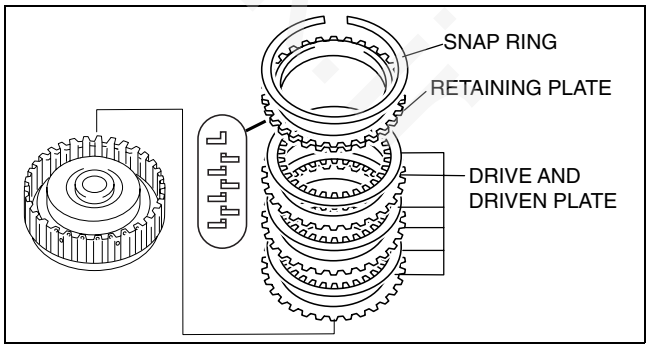
Caution
- **Depress the 3–4 seal plate only enough to install the snap ring. Overpressing will damage the 3–4 seal plate assembly edges.**



B3E0517A258

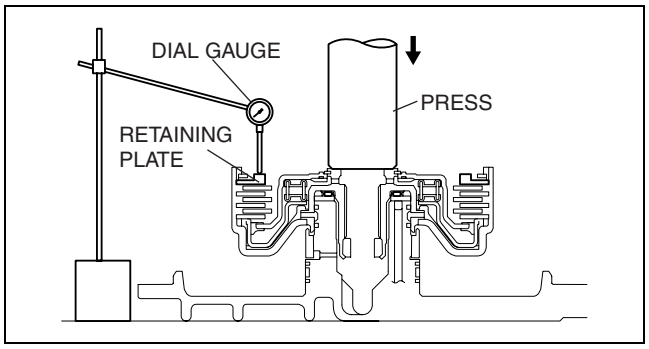
(5) Compress the spring and retainer component and 3–4 seal plate.
(6) Install the snap ring.
(7) Remove the **SST**.

(8) Install the drive and driven plates in the following order.
Driven—Drive—Driven—Drive—Driven—Drive
(9) Install the retaining plate.



B3E0517A260

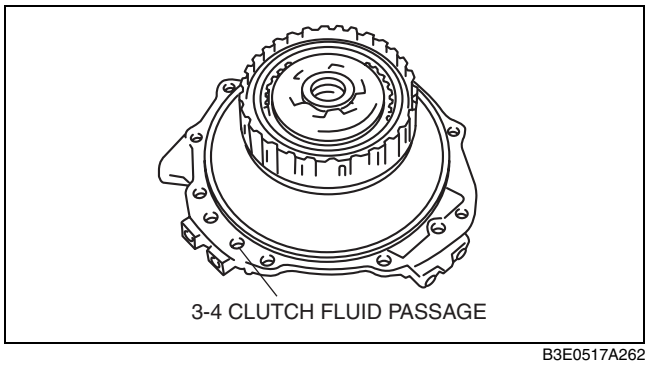
12. Measure the 3–4 clutch clearance.
    (1) Install the 3–4 clutch in the end cover, and set the dial gauge.
    (2) Secure the 3–4 clutch by lightly pressing down with a press or similar tool.



B3E0517A261

    (3) Apply compressed air to the part indicated in the figure and let the 3–4 clutch piston stroke three times.

Air pressure
392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}



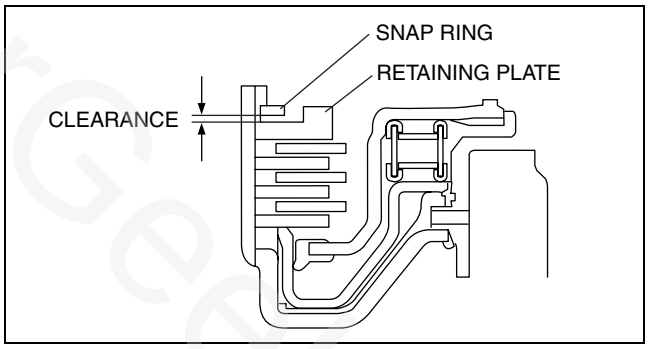
B3E0517A262

    (4) Apply compressed air and operate the 3–4 clutch piston. Read the value when the indicator of the dial gauge stops.
    (5) Release the compressed air and read the dial gauge when the 3–4 clutch piston is not operating.
    (6) Calculate the 3–4 clutch clearance according to the following formula:
    step (4) value – step (5) value = 3–4 clutch clearance.
    (7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

3-4 clutch clearance
Standard: 1.10—1.40 mm {0.043—0.055 in}

- If not within the specification, remove the snap ring and measure its thickness.

    (8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.



D6E517ZA5107

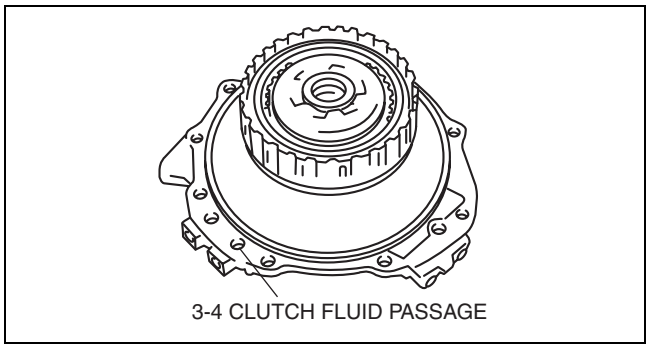
Snap ring size for 3-4 clutch clearance

Range mm {in}	Snap ring sizes mm {in}
2.400—2.600 {0.095—0.102}	1.2 {0.047}
2.600—2.800 {0.103—0.110}	1.4 {0.055}
2.800—3.000 {0.111—0.118}	1.6 {0.063}
3.000—3.200 {0.119—0.125}	1.8 {0.071}
3.200—3.400 {0.126—0.133}	2.0 {0.079}
3.400—3.600 {0.134—0.141}	2.2 {0.087}

    (9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.

13. Inspect the 3–4 clutch operation.
    (1) Install the 3–4 clutch drum to the end cover.
    (2) Inspect the 3–4 clutch operation by applying compressed air as shown.

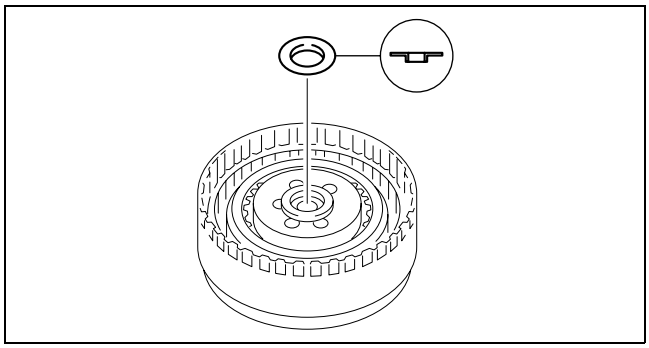
    Air pressure
    392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}



B3E0517A262

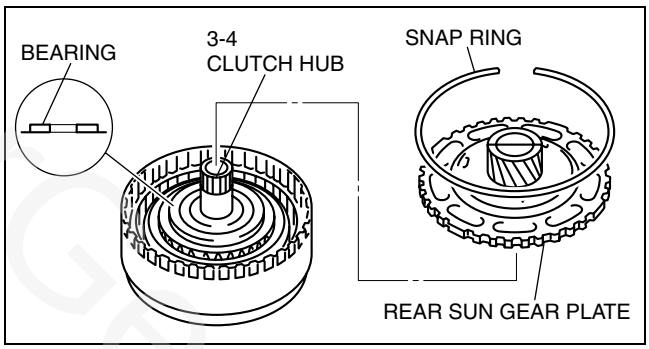
14. Install the 3–4 clutch component to the 2–4 brake drum.

15. Apply petroleum jelly to the bearing, and secure it onto the 3–4 clutch component.



B3E0517A264

16. Install the 3–4 clutch hub.
17. Apply petroleum jelly to the bearing, and secure it onto the 3–4 clutch hub as shown in the figure.
18. Install the rear sun gear plate onto the 2–4 brake drum.
19. Install the snap ring.

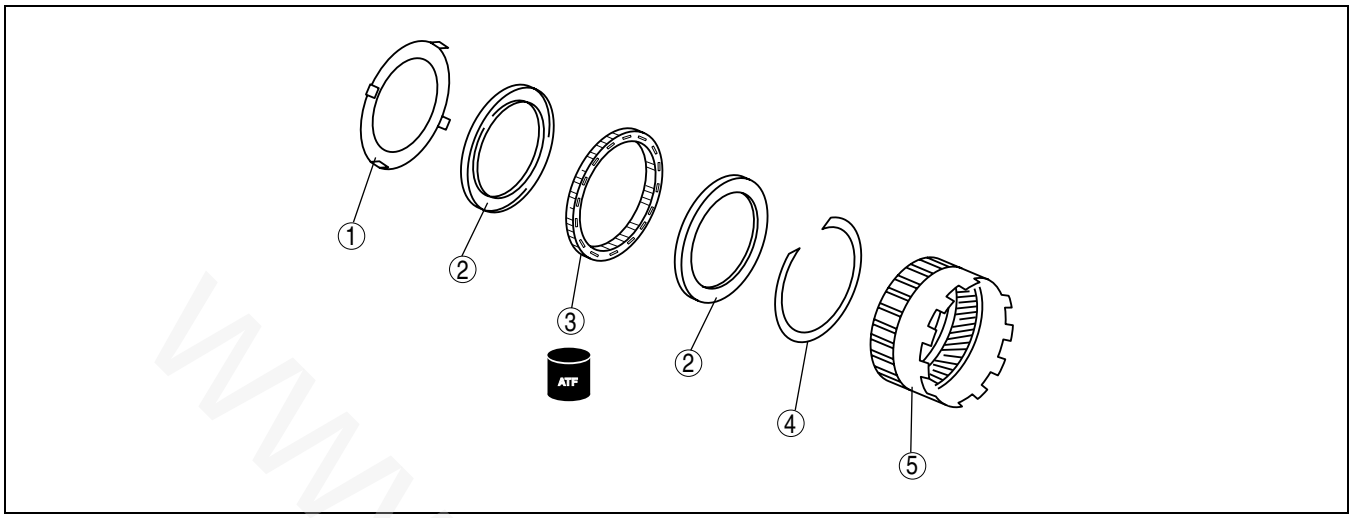


B3E0517A265

FRONT INTERNAL GEAR ONE-WAY CLUTCH NO.1 COMPONENT DISASSEMBLY/ASSEMBLY

E6U051719500A15

1. Perform the preinspection before disassembly.
   (See 05–17–111 Front Internal Gear and One-Way Clutch No.1 Component.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

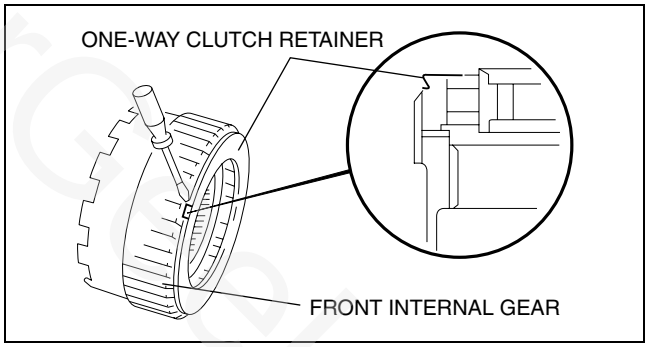


B3E0517A119

1	One-way clutch retainer (See 05–17–34 One-Way Clutch Retainer Disassembly Note.)
2	Side race
3	One-way clutch No.1
4	Snap ring
5	Front internal gear

One-Way Clutch Retainer Disassembly Note

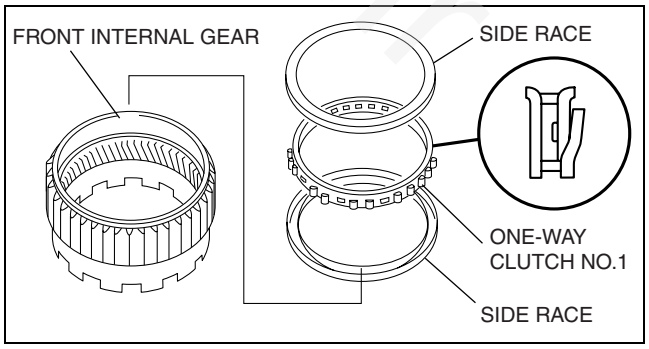
- Remove the one-way clutch retainer using a flathead screwdriver, etc. as shown in the figure.



B3E0517A120

Assembly Procedure

1. Install the snap ring.
2. Install the one-way clutch No.1 to the front internal gear in the direction of the arrow (on the one-way clutch) as shown in the figure.
3. Install the side race.
4. Install the one-way clutch retainer.

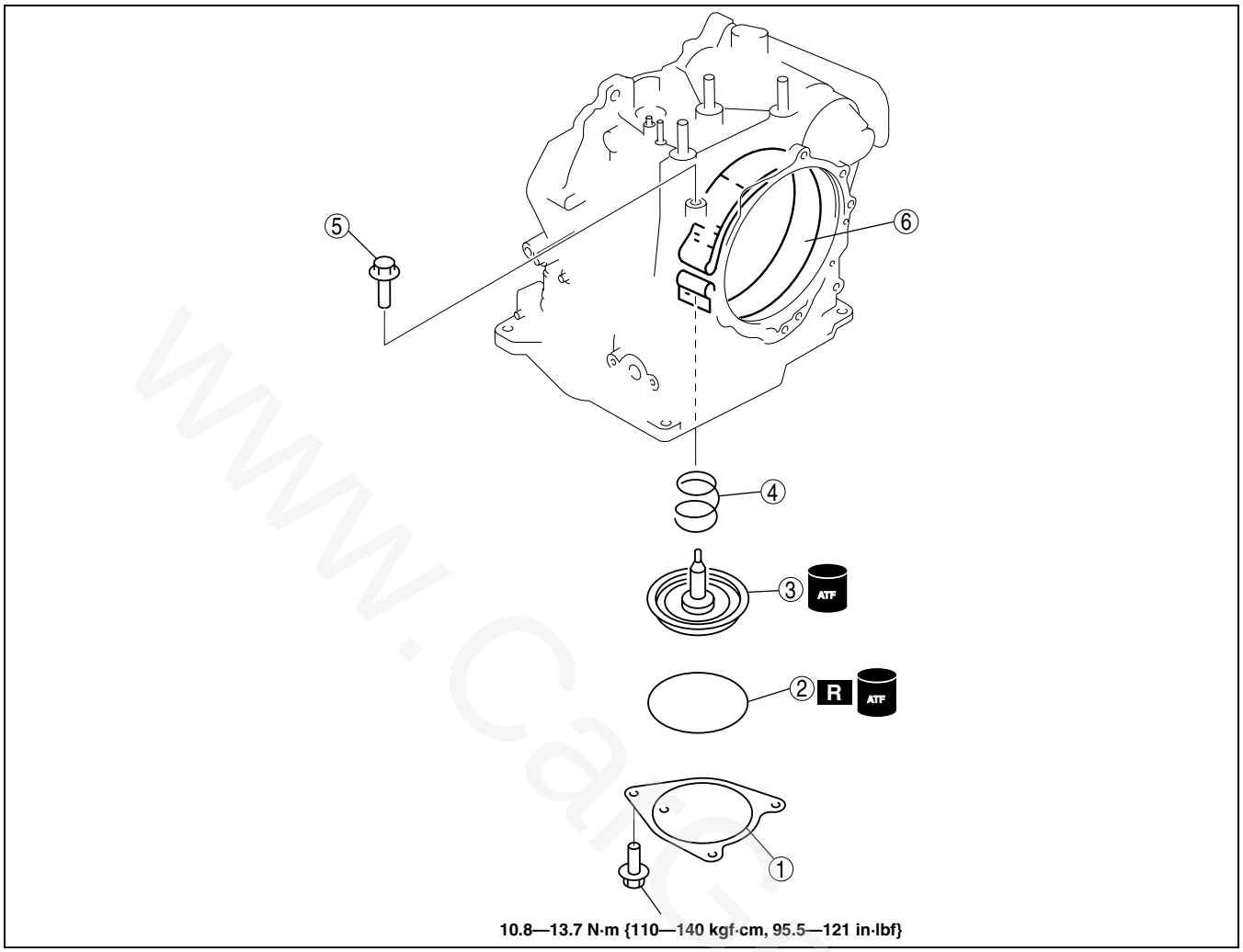


D6E517ZA5038

BAND SERVO DISASSEMBLY/ASSEMBLY

E6U051719500A16

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



D6E517ZA5039

1	Servo retainer
2	O-ring
3	Servo piston

4	Servo return spring
5	Band strut
6	2–4 brake band

Assembly Procedure

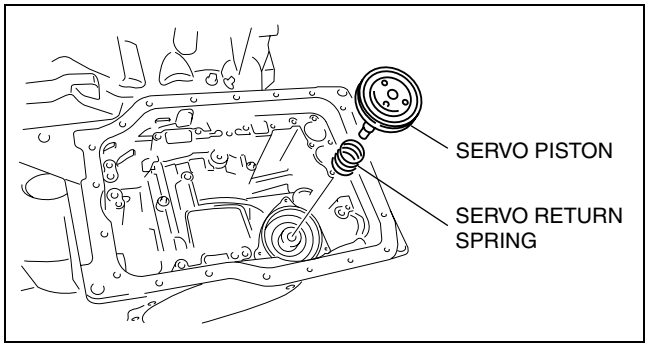
1. Measure the spring free length.

Servo return spring (Standard)

Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
34.0 {1.340}	36.4 {1.430}	2.5	4.0 {0.160}

- If not as specified, replace the spring.

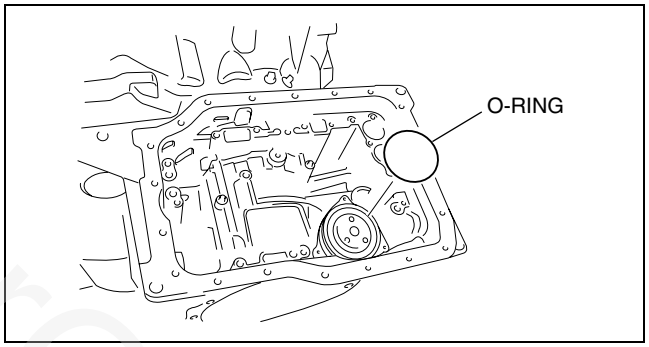
2. Install the servo return spring to the transaxle case.
3. Install the servo piston to the transaxle case.



D6E517ZA5040

4. Apply ATF to new O-ring and install it to the transaxle case.

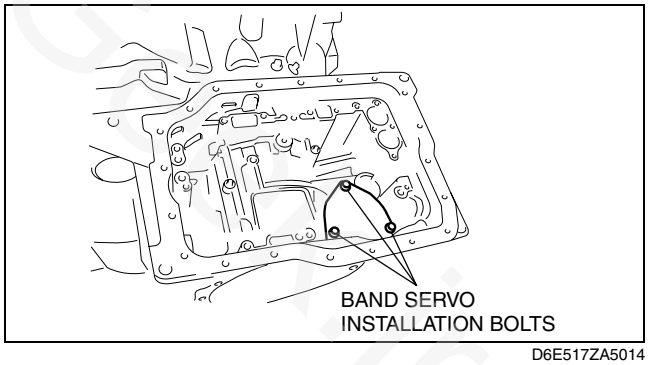
   O-ring inner diameter
   70.2 mm {2.76 in}



D6E517ZA5041

5. Install the servo retainer by tightening the bolts evenly and gradually.

   Tightening torque
   11—14 N·m
   {113—142 kgf·cm, 97.4—123 in·lbf}

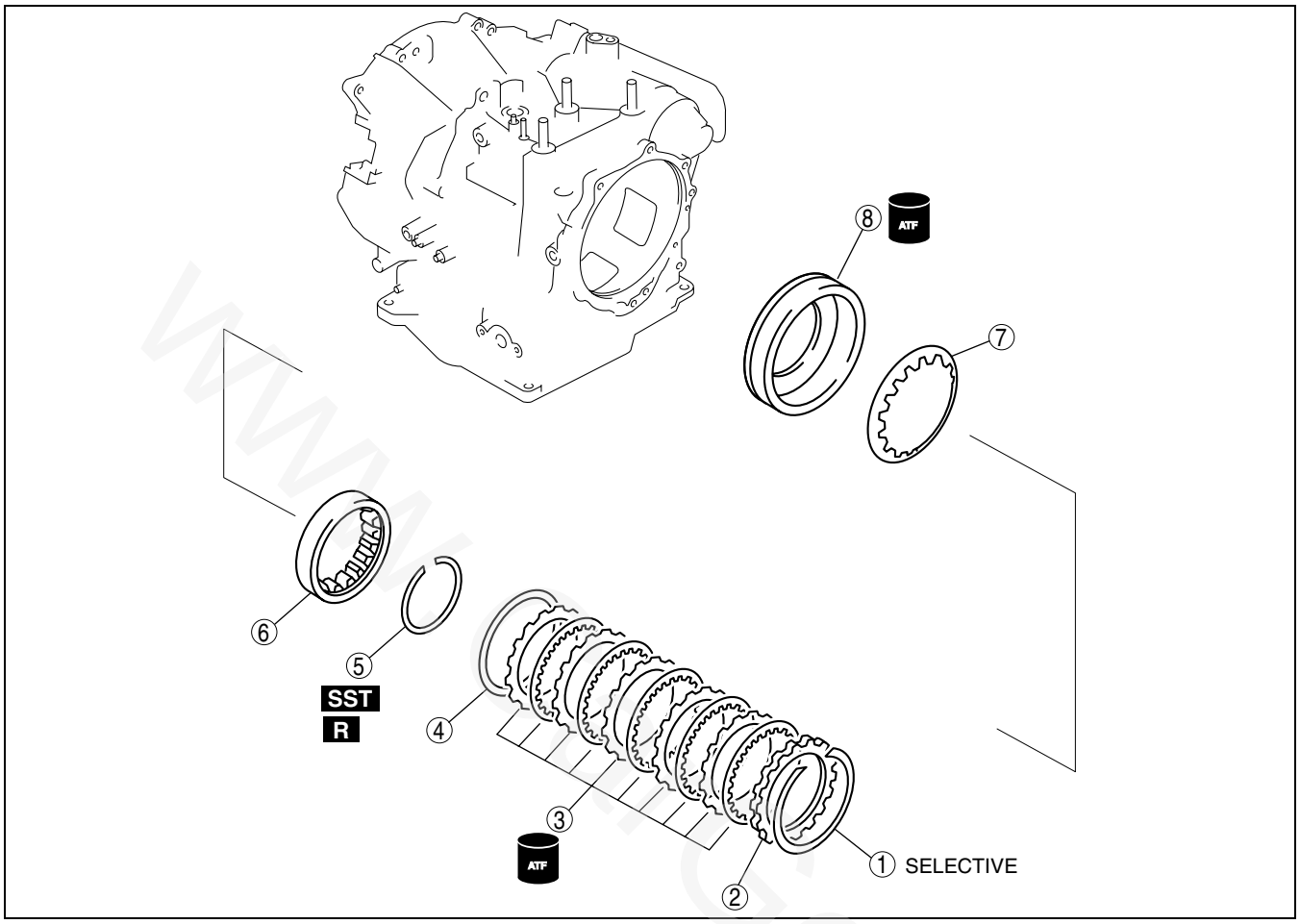


D6E517ZA5014

LOW AND REVERSE BRAKE AND ONE-WAY CLUTCH INNER RACE DISASSEMBLY/ASSEMBLY

E6U051719500A17

1. Perform the preinspection before disassembly.
   (See 05–17–111 Low and Reverse Brake Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.



D6E517ZA5042

1	Snap ring
2	Retaining plate
3	Drive and driven plates
4	Dish plate
5	Snap ring (See 05–17–37 Snap Ring Disassembly Note.)

6	One-way clutch inner race
7	Piston return spring
8	Low and reverse brake piston (See 05–17–38 Low and Reverse Brake Piston Disassembly Note.)

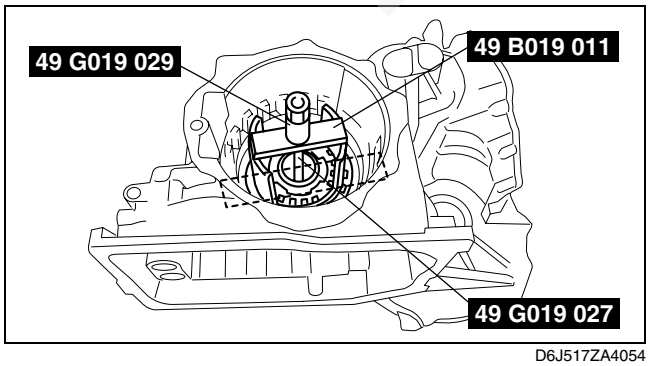
Snap Ring Disassembly Note

1. Install the **SSTs** as shown.

Caution

- **Depress the one-way clutch inner race only enough to remove the snap ring. Overpressing will damage the one-way clutch inner race assembly edges.**

2. Compress the one-way clutch inner race.
3. Remove the snap ring.
4. Remove the **SSTs** and remove one-way clutch inner race and the piston return spring.

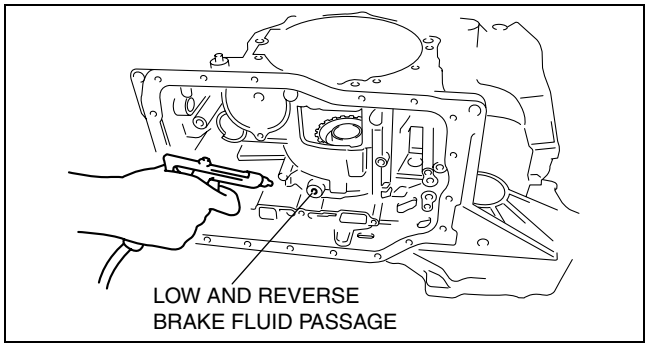


D6J517ZA4054

Low and Reverse Brake Piston Disassembly Note

- Remove the low and reverse brake piston by applying compressed air through the fluid passage.

  Air pressure
  98.1 kPa {1.0 kgf/cm^2, 14 psi} max.



D6E517ZA5043

Assembly Procedure

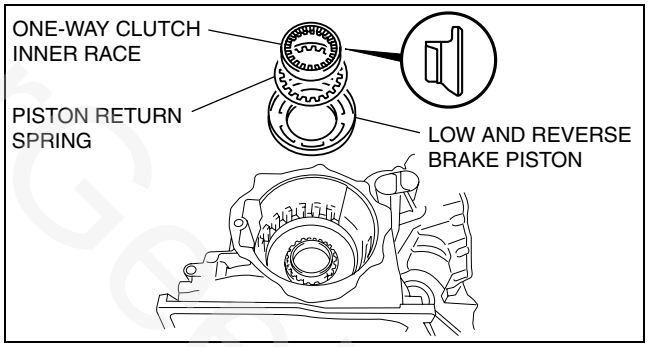
1. Measure the facing thickness in three places, and determine the average of the three readings.

   Low and reverse brake drive plate thickness
   Standard: 1.60 mm {0.063 in}
   Minimum: 1.45 mm {0.057 in}

   - If not within the specification, replace the drive plates.

   Caution
   - **Installing the low and reverse brake piston may damage its seal. Carefully install the low and reverse brake piston by pushing evenly around the circumference.**

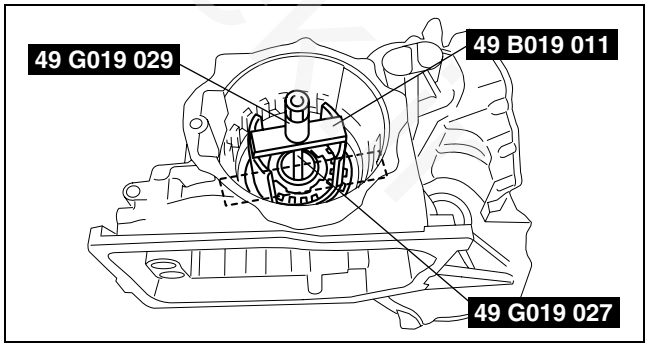
2. Apply ATF to the circumference of the low and reverse brake piston seal, and install the piston to the transaxle case.
3. Install the piston return spring and one-way clutch to the transaxle case.



D6E517ZA5044

4. Install the **SSTs** as shown.

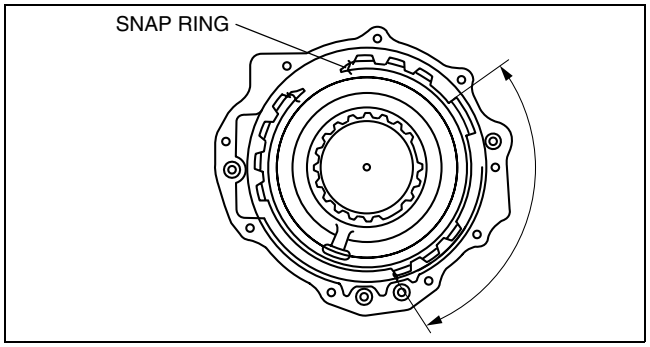
   Caution
   - **Depress the one-way clutch inner race only enough to install the snap ring. Overpressing will damage the one-way clutch inner race assembly edges.**



D6J517ZA4054

5. Compress the one-way clutch inner race.

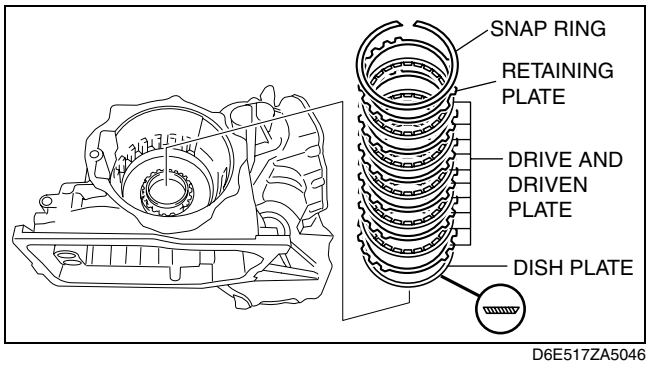
Caution
- **The transaxle body may be damaged if installed incorrectly. Make sure to install the transaxle body in such a way that the end of the snap ring does not enter the area shown in the figure.**



D6E517ZA5045

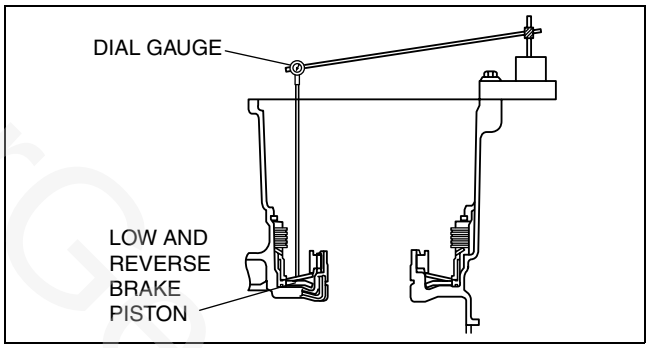
6. Install the snap ring.
7. Remove the **SSTs**.

8. Install the dish plate.
9. Install the drive and driven plates in the following order.
   Driven—Drive—Driven—Drive—Driven—Drive—Driven—Drive—Driven—Drive
10. Install the retaining plate and the snap ring.



D6E517ZA5046

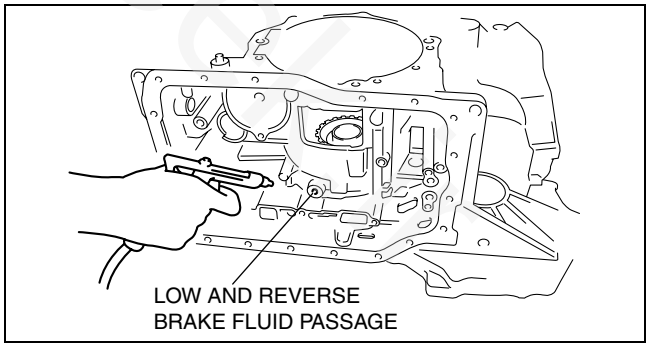
11. Measure the low and reverse brake clearance.
    (1) Set the dial gauge to the low and reverse brake.
    (2) Set the measuring point of the dial gauge to the low and reverse brake piston.



B3E0517A133

    (3) Apply compressed air to the part indicated in the figure and let the low and reverse brake piston stroke three times.

Air pressure
98.1 kPa {1.0 kgf/cm^2, 14 psi}



D6E517ZA5043

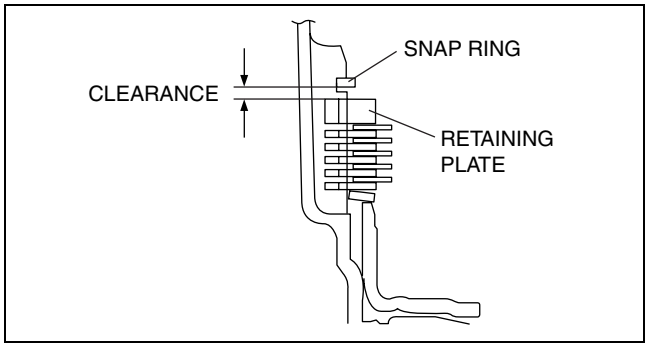
    (4) Apply compressed air and operate the low and reverse brake piston. Read the value when the indicator of the dial gauge stops.
    (5) Release the compressed air and read the dial gauge when the low and reverse brake piston is not operating.
    (6) Calculate the low and reverse brake clearance according to the following formula:
    Step (4) value—Step (5) value= low and reverse brake clearance.

(7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

Low and reverse brake clearance
2.20—2.50 mm {0.087—0.098 in}

- If not within the specification, remove the snap ring and measure its thickness.

(8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.



D6E517ZA5047

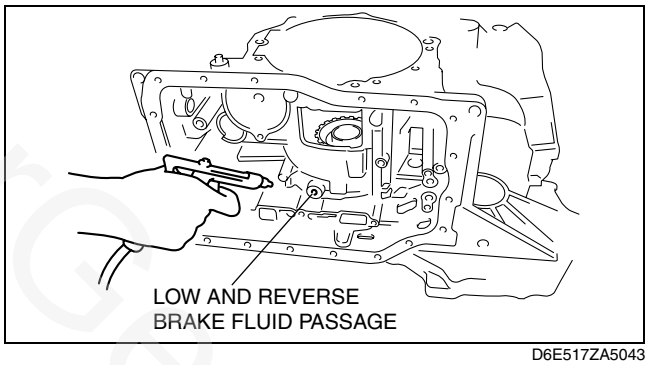
Snap ring size for low and reverse brake clearance

Range mm {in}	Snap ring sizes mm {in}
4.050—4.250 {0.159—0.167}	1.8 {0.071}
4.250—4.450 {0.167—0.175}	2.0 {0.079}
4.450—4.650 {0.175—0.183}	2.2 {0.087}
4.650—4.850 {0.183—0.190}	2.4 {0.094}
4.850—5.050 {0.190—0.199}	2.6 {0.102}
5.050—5.250 {0.199—0.207}	2.8 {0.110}
5.250—5.450 {0.207—0.215}	3.0 {0.118}

(9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.

12. Inspect the low and reverse brake operation by applying compressed air as shown.

Air pressure
98.1 kPa {1.0 kgf/cm^2, 14 psi}

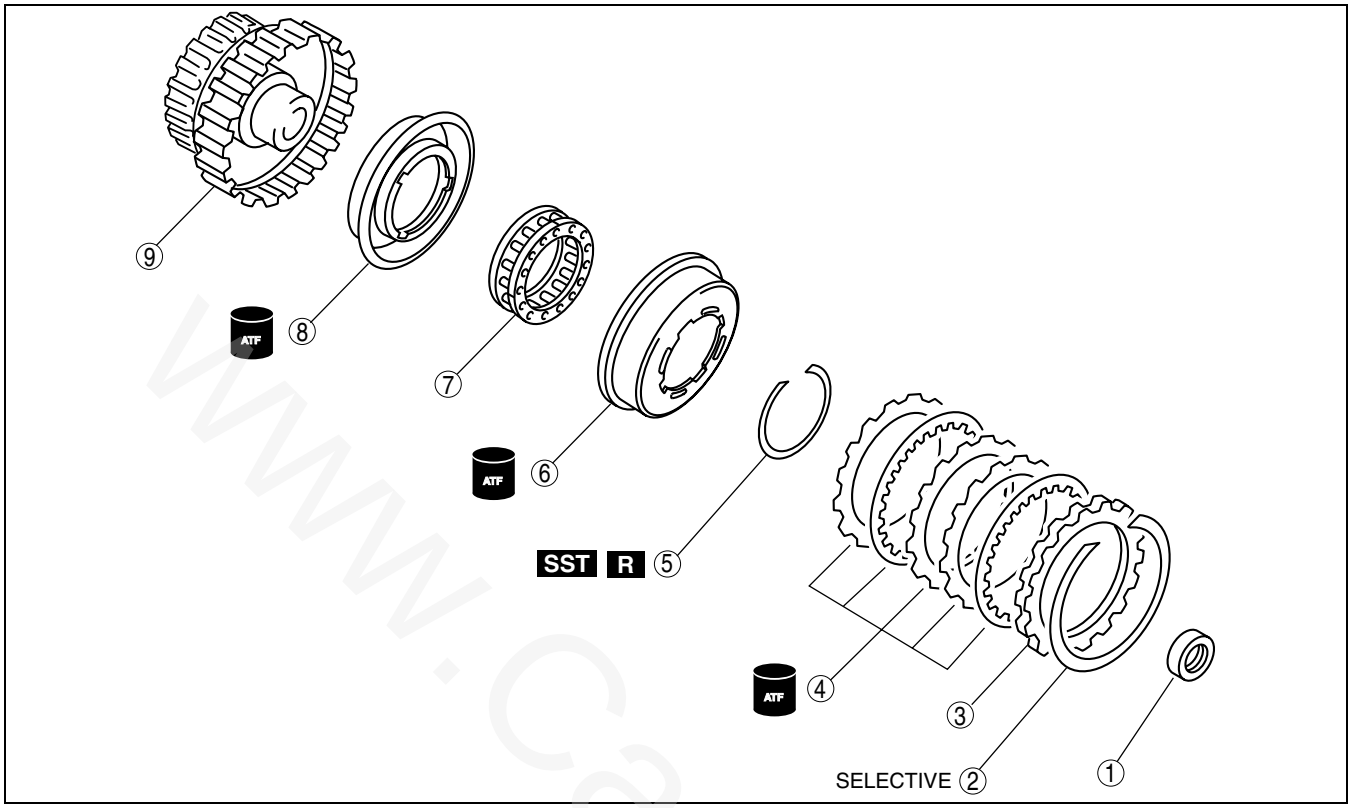


D6E517ZA5043

DIRECT CLUTCH DISASSEMBLY/ASSEMBLY

E6U051719500A18

1. Perform the preinspection before disassembly. (See 05–17–113 Direct Clutch Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.



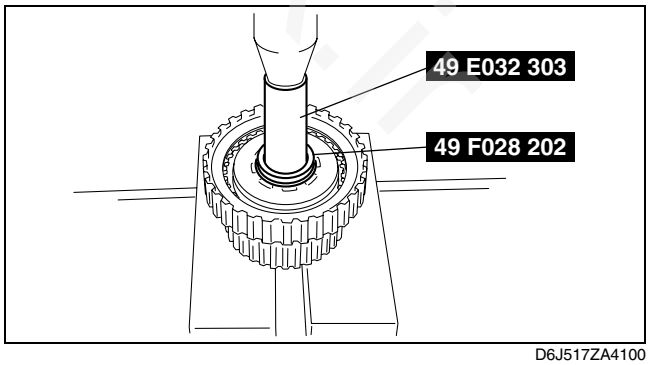
D6E517ZA5048

1	Needle bearing (See 05–17–41 Needle Bearing Disassembly Note.)
2	Snap ring
3	Retaining plate
4	Drive and driven plate
5	Snap ring (See 05–17–42 Snap Ring (Direct clutch) Disassembly Note.)

6	Seal plate
7	Spring and retainer component
8	Direct clutch piston (See 05–17–42 Direct Clutch Piston Disassembly Note.)
9	Direct clutch drum

Needle Bearing Disassembly Note

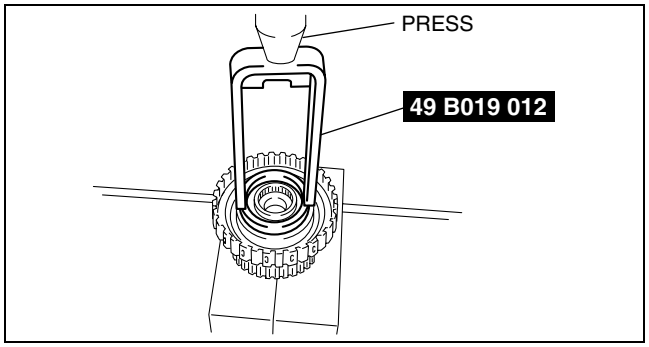
1. Remove the needle bearing using the **SST** as shown in the figure.



D6J517ZA4100

Snap Ring (Direct clutch) Disassembly Note

1. Install the **SST** as shown.



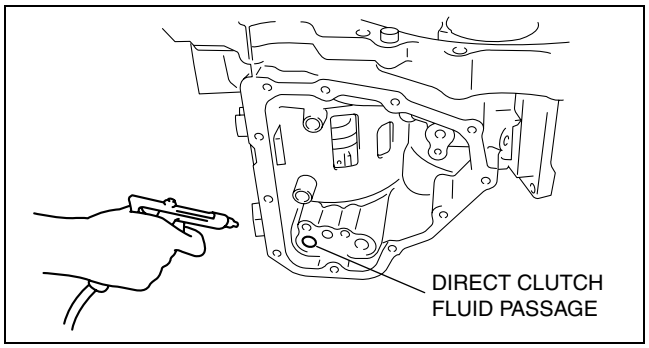
D6E517ZA5049

Caution
- **Depress the seal plate only enough to remove the snap ring. Overpressing will damage the seal plate assembly edges.**

2. Compress the seal plate.
3. Remove the snap ring.
4. Remove the **SST**, then remove the seal plate and spring and retainer component.

Direct Clutch Piston Disassembly Note

1. Set the direct clutch drum onto the transaxle case.
2. Remove the direct clutch piston from the direct clutch drum by applying compressed air through the fluid passage.



D6E517ZA5050

Air pressure
392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}

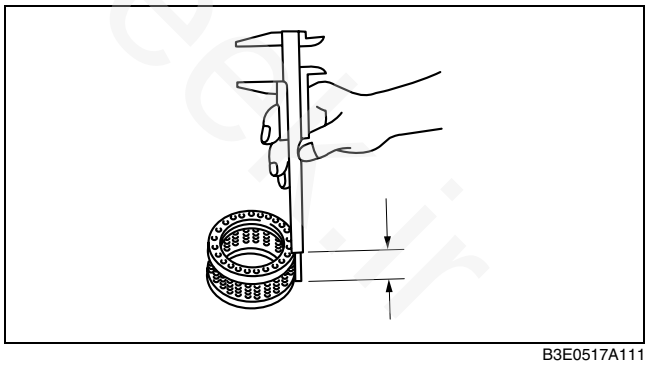
Assembly Procedure

1. Measure the facing thickness in three places and calculate the average value.

Direct clutch drive plate thickness
Standard: 1.80 mm {0.071 in}
Minimum: 1.65 mm {0.065 in}

- If not within the specification, replace the drive plates.

2. Measure the free length of the spring and inspect for deformation.



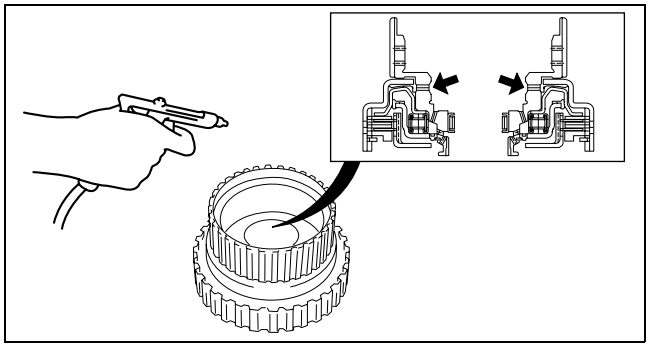
B3E0517A111

Direct clutch springs and retainer component free length
Standard: 17.2 mm {0.677 in}
Minimum: 15.2 mm {0.598 in}

- If not within the specification, replace the spring and retainer.

3. Verify that there is airflow when applying compressed air through the fluid passage of direct clutch drum. (four locations)

   Air pressure
   392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}



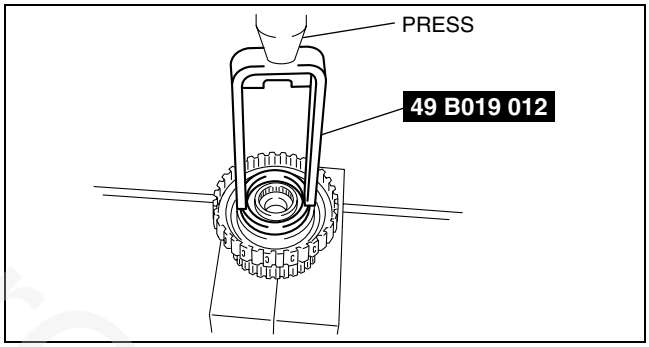
D6J517ZA4181

4. Replace the direct clutch drum if damaged or malfunctioning.

5. Install the direct clutch.

   Caution
   - **Installing the direct clutch piston may damage its seal. Carefully install the direct clutch piston by pushing evenly around the circumference.**

   (1) Apply ATF to the circumference of the direct clutch piston seal, and install the piston in to the direct clutch drum.
   (2) Install the spring and retainer.
   (3) Apply ATF to the seal plate, and install it onto the direct clutch drum.
   (4) Install the **SST** as shown.

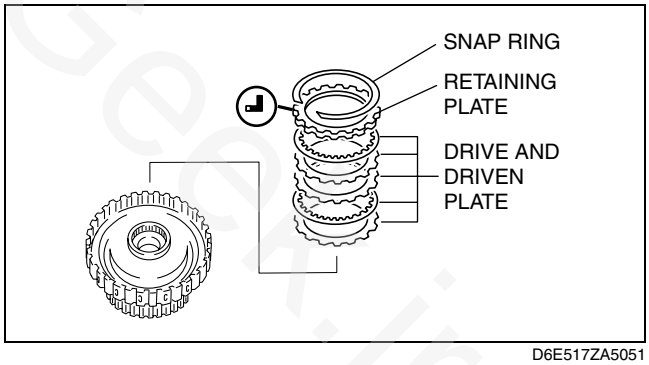


D6E517ZA5049

   Caution
   - **Depress the seal plate only enough to install the snap ring. Overpressing will damage the seal plate assembly edges.**

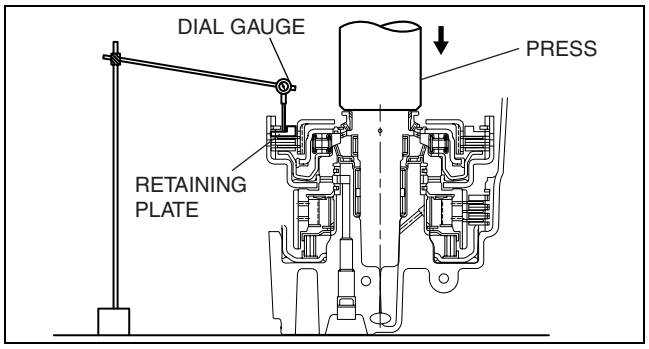
   (5) Compress the spring and retainer component and seal plate.
   (6) Install the snap ring.
   (7) Remove the **SST**.

   (8) Install the drive and driven plates in the following order.
   Driven—Drive—Driven—Driven—Drive
   (9) Install the retaining plate.
   (10) Install the snap ring.



D6E517ZA5051

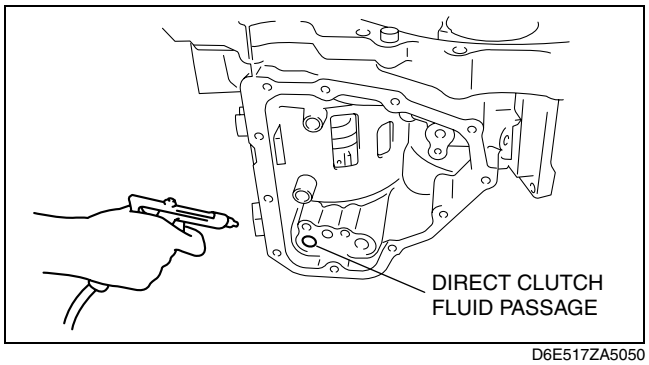
6. Measure the direct clutch clearance.
   (1) Install the direct clutch in the transaxle case, and set the dial gauge.
   (2) Secure the direct clutch by lightly pressing down with a press or similar tool.



D6E517ZA5052

   (3) Apply compressed air to the part indicated in the figure and let the direct clutch piston stroke three times.

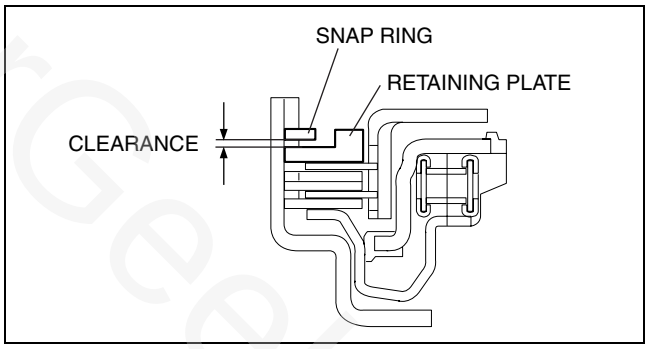
Air pressure
392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}



D6E517ZA5050

   (4) Apply compressed air and operate the direct clutch piston. Read the value when the indicator of the dial gauge stops.
   (5) Release the compressed air and read the dial gauge when the direct clutch piston is not operating.
   (6) Calculate the direct clutch clearance according to the following formula:
   step (4) value – step (5) value = direct clutch clearance.
   (7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

Direct clutch clearance
Standard: 1.10—1.40 mm {0.043—0.055 in}



D6E517ZA5053

- If not within the specification, remove the snap ring and measure its thickness.

   (8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.

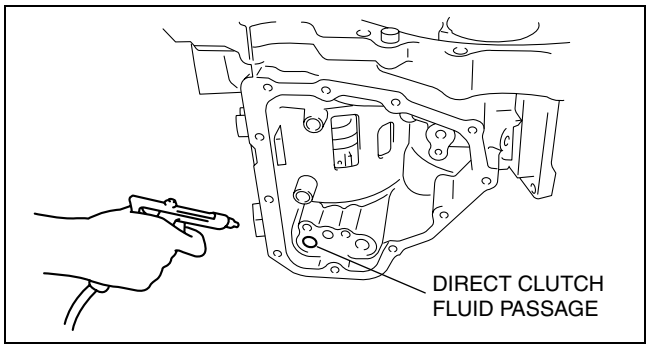
Snap ring size for direct clutch clearance

Range mm {in}	Snap ring sizes mm {in}
2.424—2.624 {0.096—0.103}	1.2 {0.047}
2.624—2.824 {0.104—0.111}	1.4 {0.055}
2.824—3.024 {0.112—0.119}	1.6 {0.063}
3.024—3.224 {0.120—0.126}	1.8 {0.071}
3.224—3.424 {0.127—0.134}	2.0 {0.079}
3.424—3.624 {0.135—0.142}	2.2 {0.087}

   (9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.

7. Inspect the direct clutch operation.
   (1) Install the direct clutch drum to the transaxle case.
   (2) Inspect the direct clutch operation by applying compressed air as shown.

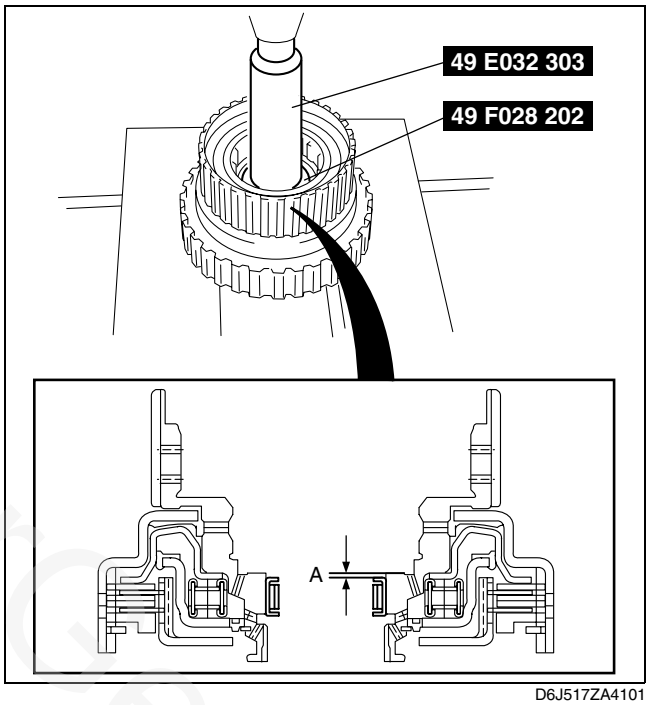
   Air pressure
   392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}



D6E517ZA5050

8. Install the needle bearing using the **SST** as shown in the figure.

   Distance A
   A: 0—0.5 mm {0—0.02 in}

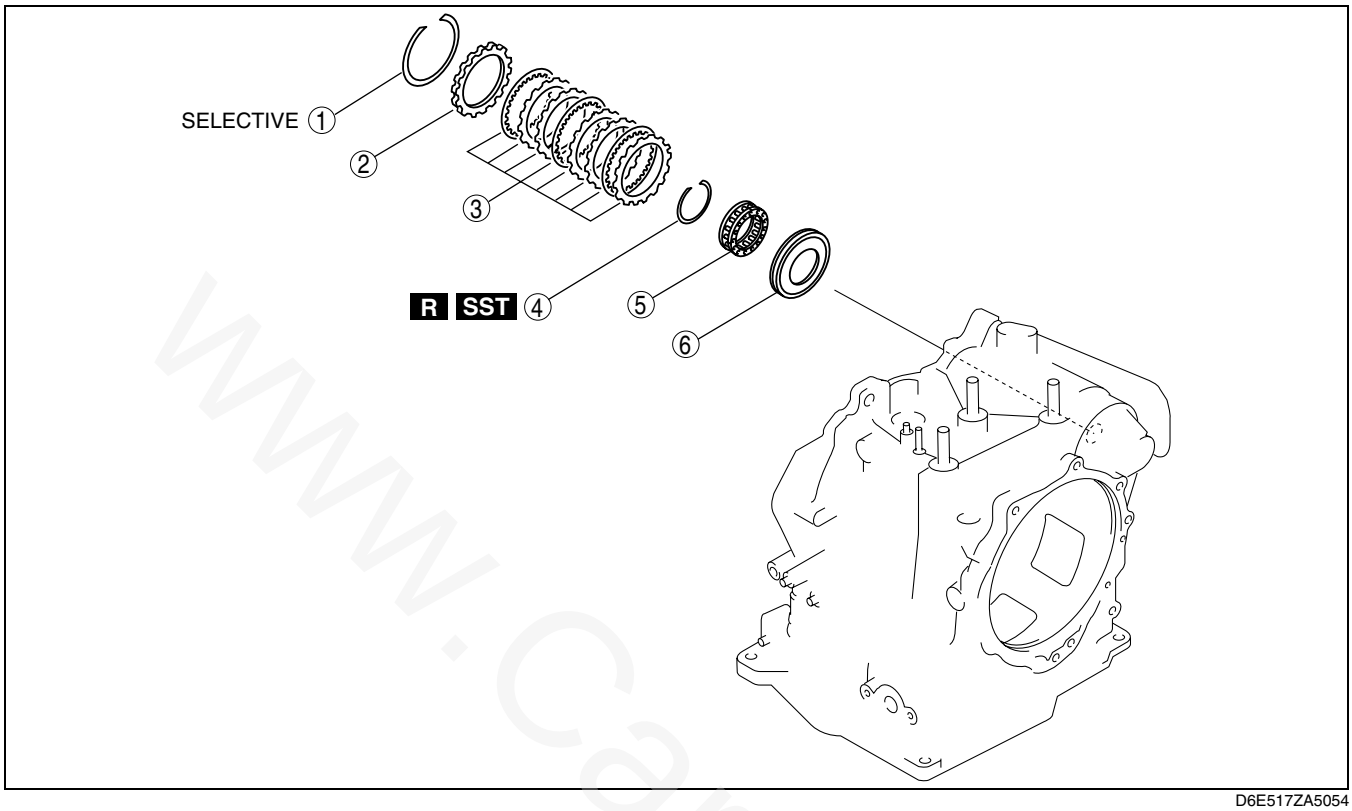


D6J517ZA4101

REDUCTION BRAKE DISASSEMBLY/ASSEMBLY

E6U051719500A19

1. Perform the preinspection before disassembly.
   (See 05–17–114 Reduction Brake Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.



D6E517ZA5054

1	Snap ring
2	Retaining plate
3	Drive and driven plates
4	Snap ring (See 05–17–46 Snap Ring Disassembly Note.)
5	Spring and retainer component
6	Reduction brake piston (See 05–17–47 Reduction Brake Piston Disassembly Note.)

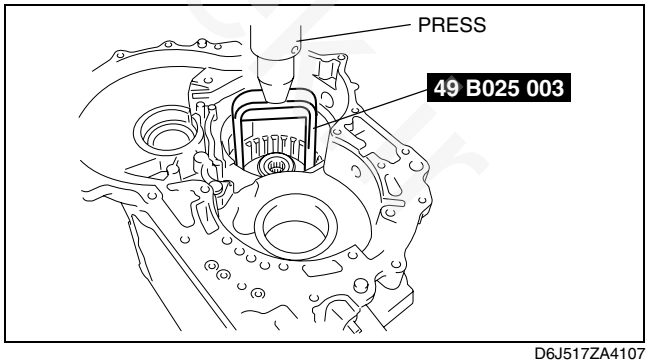
Snap Ring Disassembly Note

1. Install the **SST** as shown.

Caution

- **Depress the spring and retainer component only enough to remove the snap ring.**
  Overpressing will damage the spring and retainer component assembly edges.

2. Compress the spring and retainer component.
3. Remove the snap ring.
4. Remove the **SST** and remove spring and retainer component.

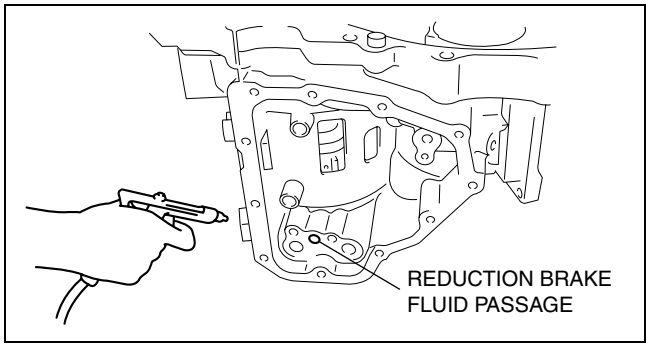


D6J517ZA4107

Reduction Brake Piston Disassembly Note

- Remove the reduction brake piston by applying compressed air through the fluid passage.

Air pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.



D6E517ZA5055

Assembly Procedure

1. Measure the facing thickness in three places, and determine the average of the three readings.

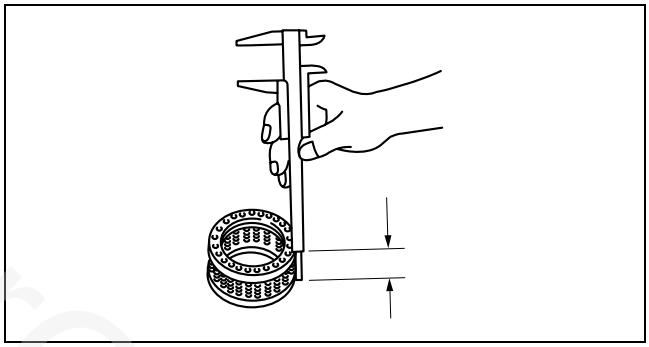
Reduction brake drive plate thickness
Standard: 1.80 mm {0.071 in}
Minimum: 1.65 mm {0.065 in}

- If not within the specification, replace the drive plates.

2. Measure the spring free length.

Reduction brake springs and retainer component free length
Standard: 18.2 mm {0.717 in}
Minimum: 16.2 mm {0.638 in}

- If not within the specification, replace the spring and retainer component.



B3E0517A111

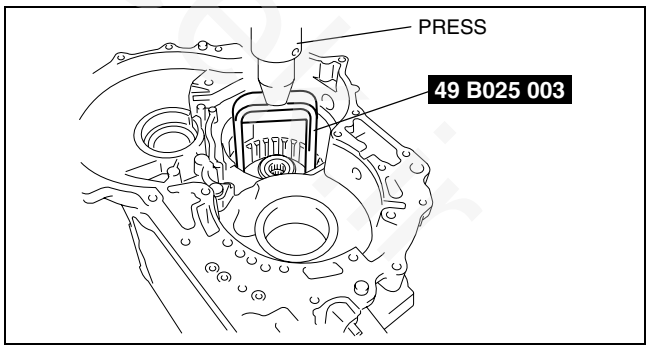
Caution

- **Installing the reduction brake piston may damage its seal. Carefully install the reduction brake piston by pushing evenly around the circumference.**

3. Apply ATF to the circumference of the reduction brake piston seal, and install the piston to the transaxle case.
4. Install the spring and retainer component to the transaxle case.
5. Install the **SST** as shown.

Caution

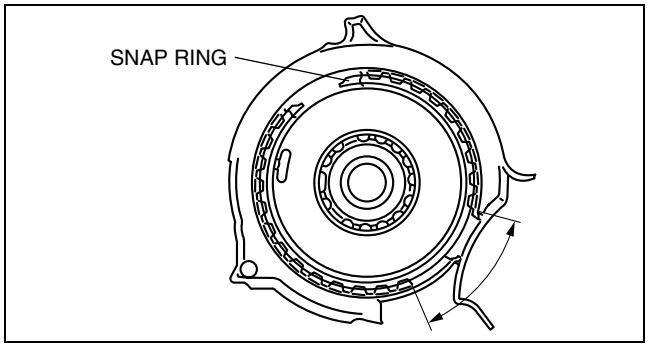
- **Depress the spring and retainer component only enough to install the snap ring.**
  Overpressing will damage the spring and retainer component assembly edges.



D6J517ZA4107

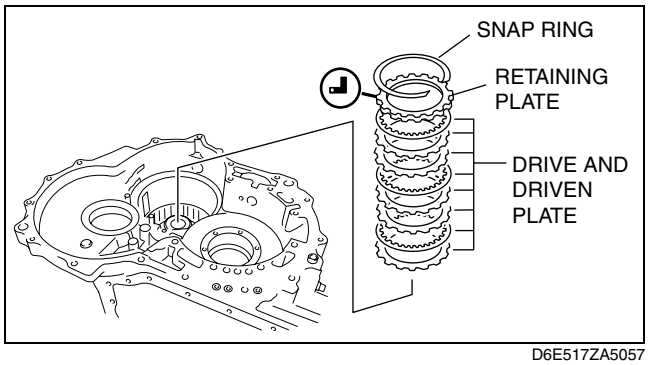
6. Compress the spring and retainer component.

Caution
- **The transaxle body may be damaged if installed incorrectly. Make sure to install the transaxle body in such a way that the end of the snap ring does not enter the area shown in the figure.**



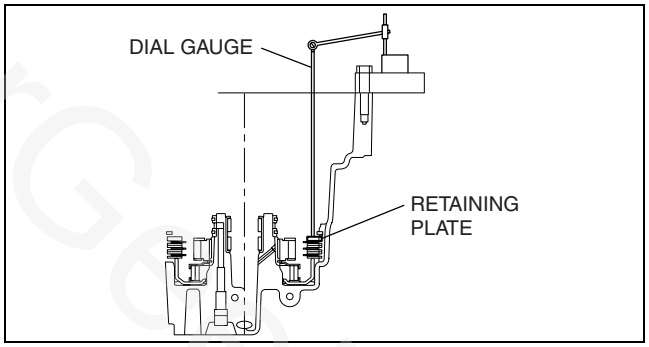
D6E517ZA5056

7. Install the snap ring.
8. Remove the **SST**.
9. Install the drive and driven plates in the following order.
   Driven—Drive—Driven—Driven—Drive—Driven—Driven—Driven—Drive
10. Install the retaining plate and the snap ring.



D6E517ZA5057

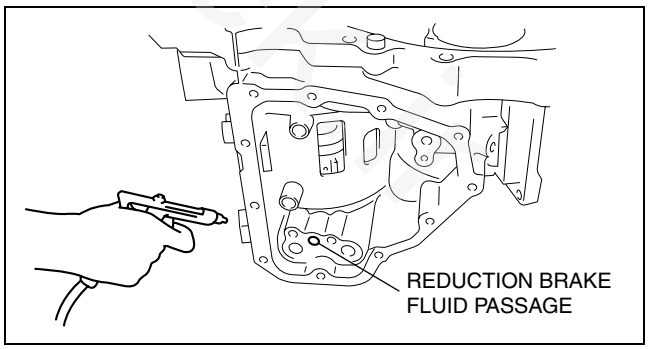
11. Measure the reduction brake clearance.
    (1) Set the dial gauge to the reduction brake.
    (2) Set the measuring point of the dial gauge to the retaining plate.



D6E517ZA5058

    (3) Apply compressed air to the part indicated in the figure and let the reduction brake piston stroke three times.

Air pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.



D6E517ZA5055

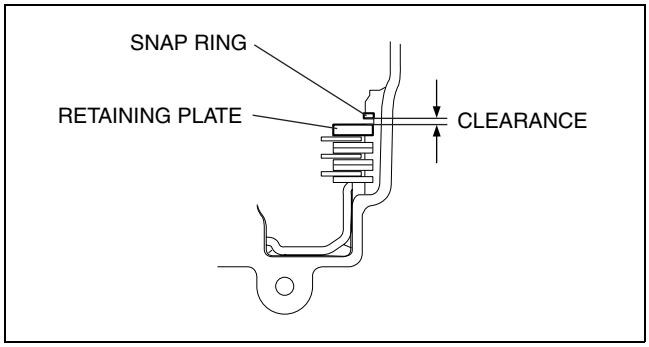
    (4) Apply compressed air and operate the reduction brake piston. Read the value when the indicator of the dial gauge stops.
    (5) Release the compressed air and read the dial gauge when the reduction brake piston is not operating.
    (6) Calculate the reduction brake clearance according to the following formula:
    Step (4) value—Step (5) value= reduction brake clearance.

(7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

Reduction brake clearance
1.50—1.80 mm {0.059—0.070 in}

- If not within the specification, remove the snap ring and measure its thickness.

(8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.



D6E517ZA5059

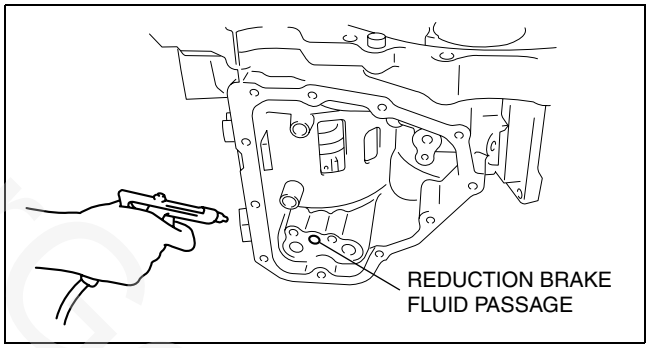
Snap ring size for reduction brake clearance

Range mm {in}	Snap ring sizes mm {in}
2.920—3.120 {0.115—0.122}	1.2 {0.047}
3.120—3.320 {0.123—0.130}	1.4 {0.055}
3.320—3.520 {0.131—0.138}	1.6 {0.063}
3.520—3.720 {0.139—0.146}	1.8 {0.071}
3.720—3.920 {0.147—0.154}	2.0 {0.079}
3.920—4.120 {0.155—0.162}	2.2 {0.087}

(9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.

12. Inspect the reduction brake operation by applying compressed air as shown.

Air pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.

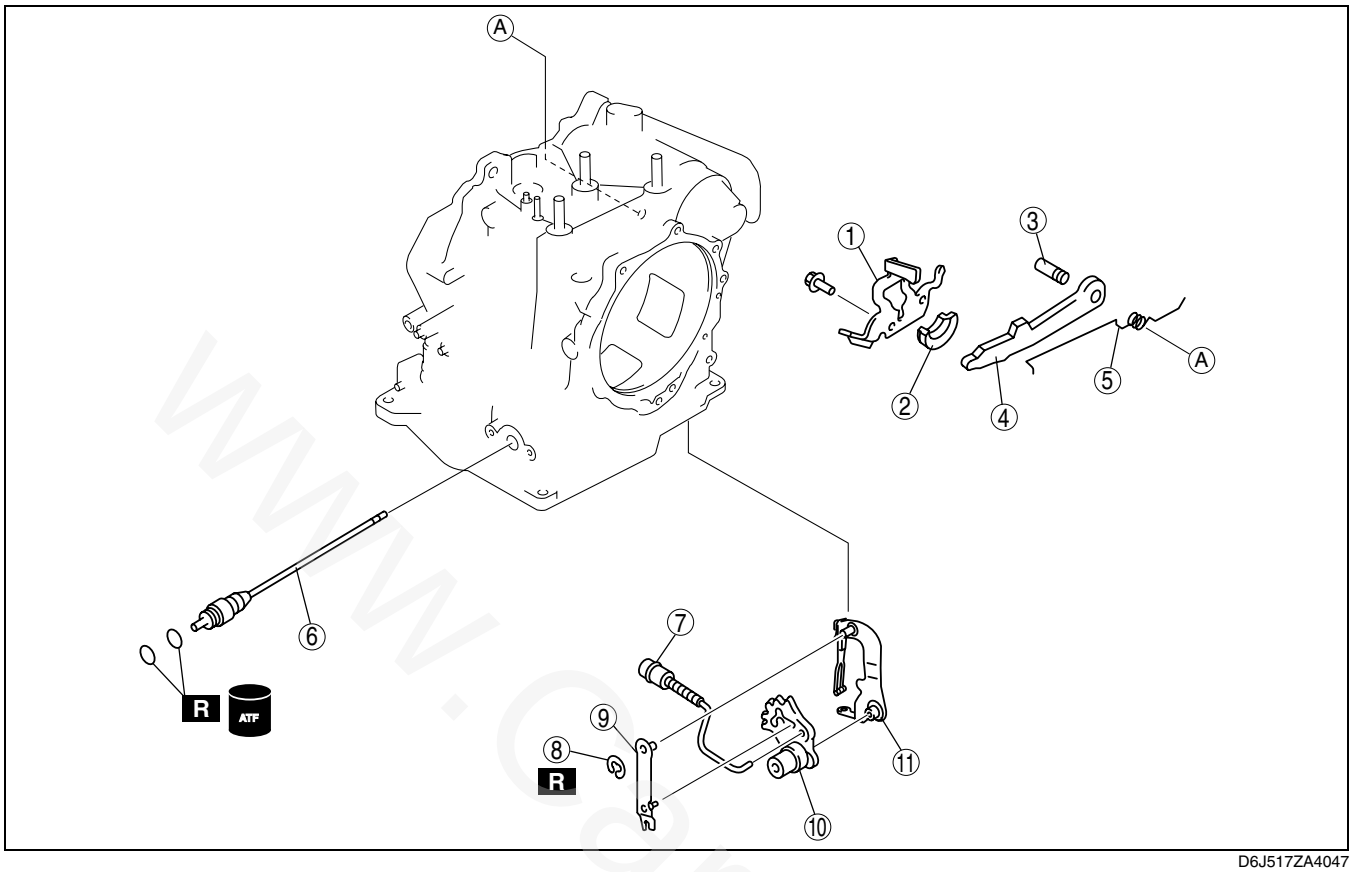


D6E517ZA5055

PARKING MECHANISM DISASSEMBLY/ASSEMBLY

E6U051721400A04

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



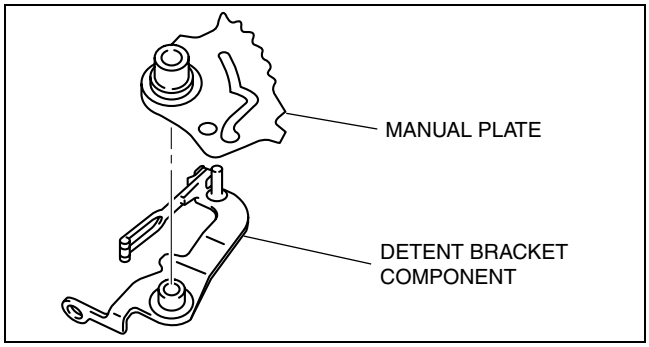
D6J517ZA4047

1	Actuator plate
2	Support actuator
3	Parking pawl shaft
4	Parking pawl
5	Pawl return spring
6	Manual shaft

7	Parking rod component
8	E-ring
9	Parking assist lever component
10	Manual plate
11	Detent bracket component

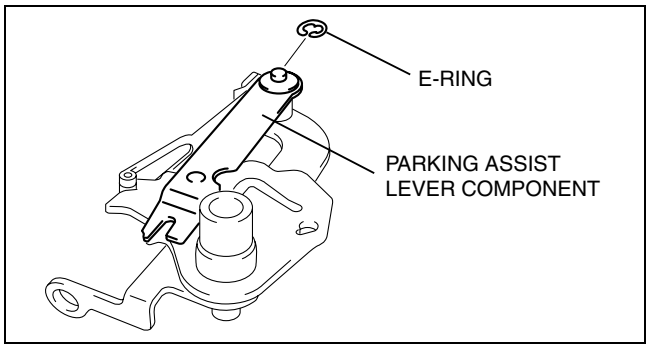
Assembly Procedure

1. Install the manual plate to the detent bracket component.
2. Install the parking assist lever component to the detent bracket component and the manual plate.



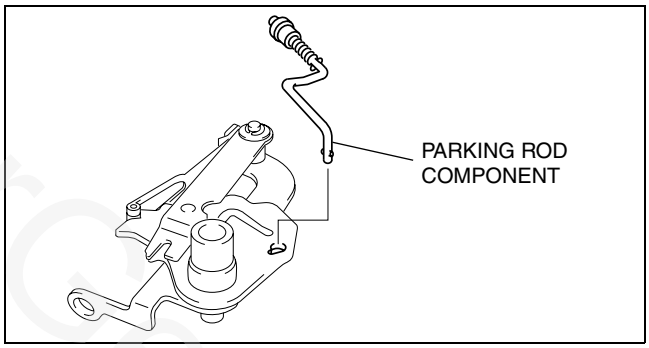
D6E517ZA5032

3. Install the E-ring.



D6E517ZA5033

4. Install the parking rod component.



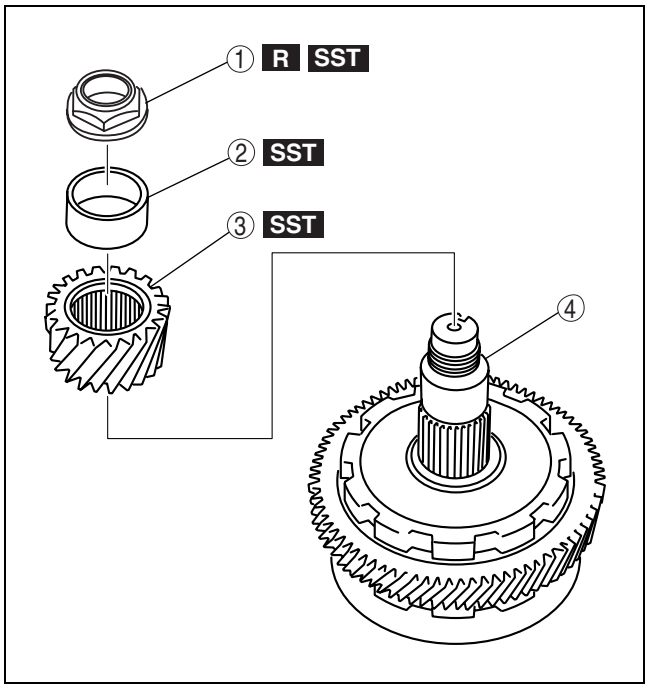
D6E517ZA5034

SECONDARY GEAR AND OUTPUT GEAR DISASSEMBLY/ASSEMBLY

E6U051719204A02

1. Remove the following parts. (See 05–17–2 AUTOMATIC TRANSAXLE DISASSEMBLY.)
   - Torque converter
   - Oil pump
   - Converter housing
   - Differential
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

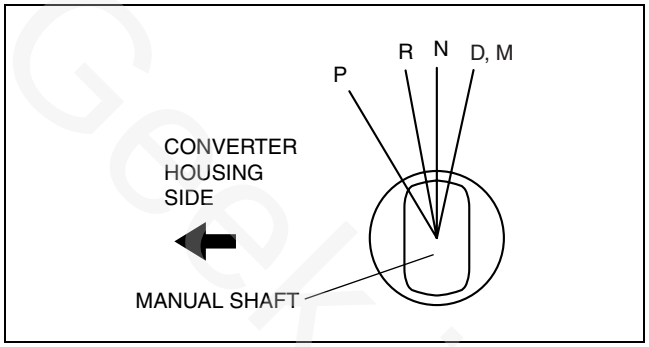
1	Lock nut (See 05–17–52 Lock nut Disassembly Note.) (See 05–17–53 Lock nut Assembly Note.)
2	Inner race (See 05–17–53 Output gear And Inner Race Disassembly Note.) (See 05–17–53 Output gear And Inner Race Assembly Note.)
3	Output gear (See 05–17–53 Output gear And Inner Race Disassembly Note.) (See 05–17–53 Output gear And Inner Race Assembly Note.)
4	Secondary gear component



D6J517ZA4097

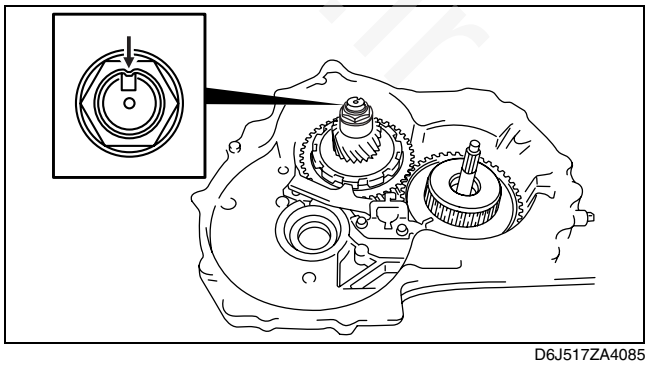
Lock nut Disassembly Note

1. Rotate the manual shaft to the P position.



D6E517AW5007

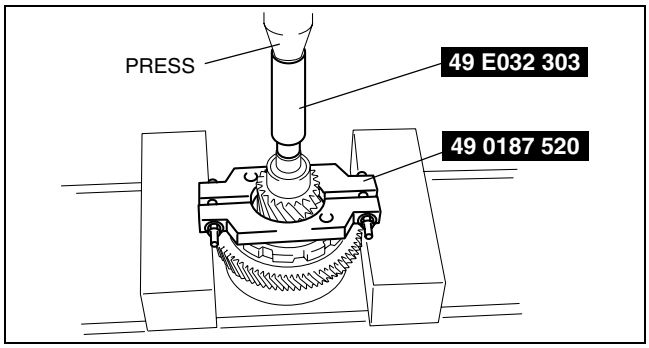
2. Knock the crimped portion of the locknut outward by using a small chisel and a hammer.
3. Remove the lock nut.



D6J517ZA4085

Output gear And Inner Race Disassembly Note

1. Remove the output gear component. (See 05–17–2 AUTOMATIC TRANSAXLE DISASSEMBLY.)
2. Remove the output gear and inner race to the secondary gear component using the **SST**.

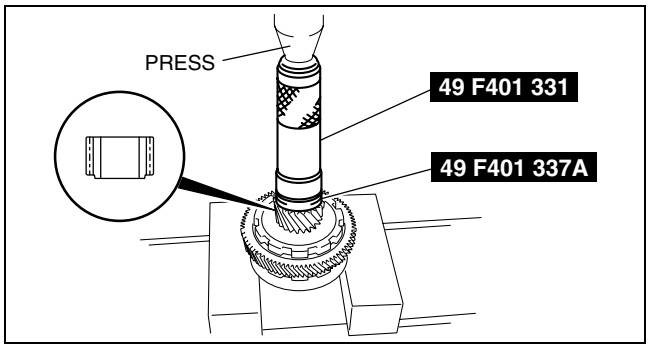


D6E517ZA5035

Output gear And Inner Race Assembly Note

1. Install the output gear to the secondary gear component using the **SST**.

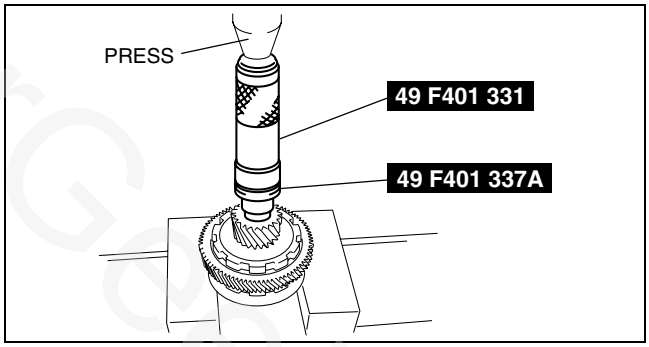
   Press-in force
   20 kN {204 kgf, 450 lbf}



D6E517ZA5036

2. Install the inner race to the secondary gear component using the **SST**.

   Press-in force
   20 kN {204 kgf, 450 lbf}

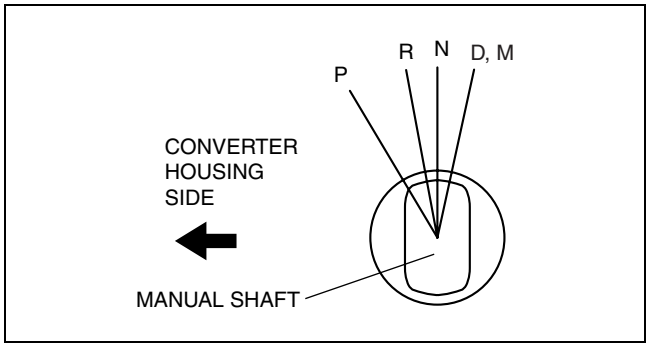


D6E517ZA5037

Lock nut Assembly Note

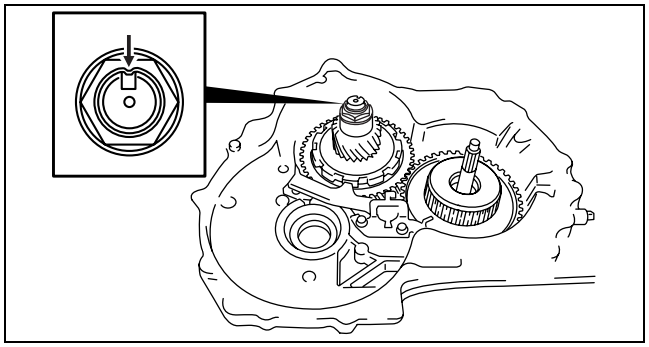
1. Install the following parts. (See 05–17–2 AUTOMATIC TRANSAXLE DISASSEMBLY.)
   - Pawl return spring
   - Parking pawl
   - Parking pawl shaft
   - Support actuator
   - Actuator plate
2. Rotate the manual shaft to the P position.
3. Install the locknut.

   Tightening torque
   100—120 N·m {10.2—12.2 kgf·m, 74—88 ft·lbf}



D6E517AW5007

4. Stake the locknut.



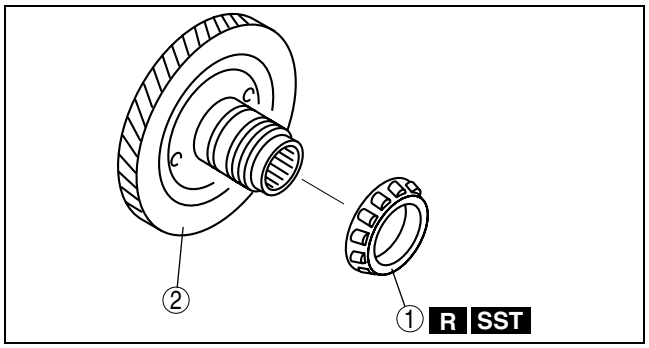
D6J517ZA4085

PRIMARY GEAR DISASSEMBLY/ASSEMBLY

E6U051719204A03

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

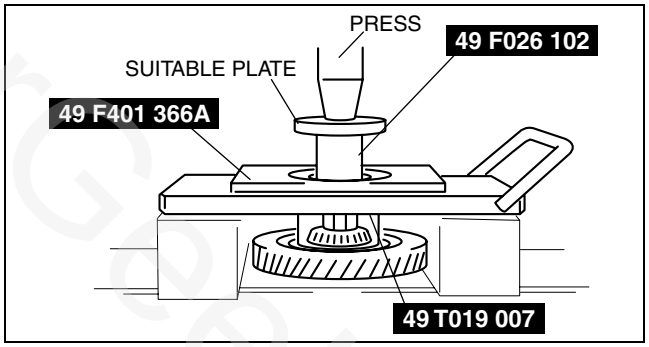
1	Bearing (See 05–17–54 Bearing Disassembly Note.) (See 05–17–54 Bearing Assembly Note.)
2	Primary gear



B3E0517A145

Bearing Disassembly Note

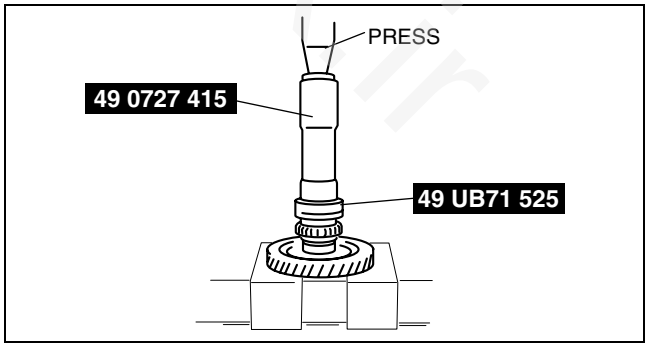
- Remove the bearing from the primary gear using the **SSTs** and suitable plate.



B3E0517A146

Bearing Assembly Note

- Install the bearing to the primary gear using the **SSTs**.



B3E0517A147

PRIMARY CONTROL VALVE BODY DISASSEMBLY/ASSEMBLY

E6U051721100A03

Primary Control Valve Body Disassembly

Caution

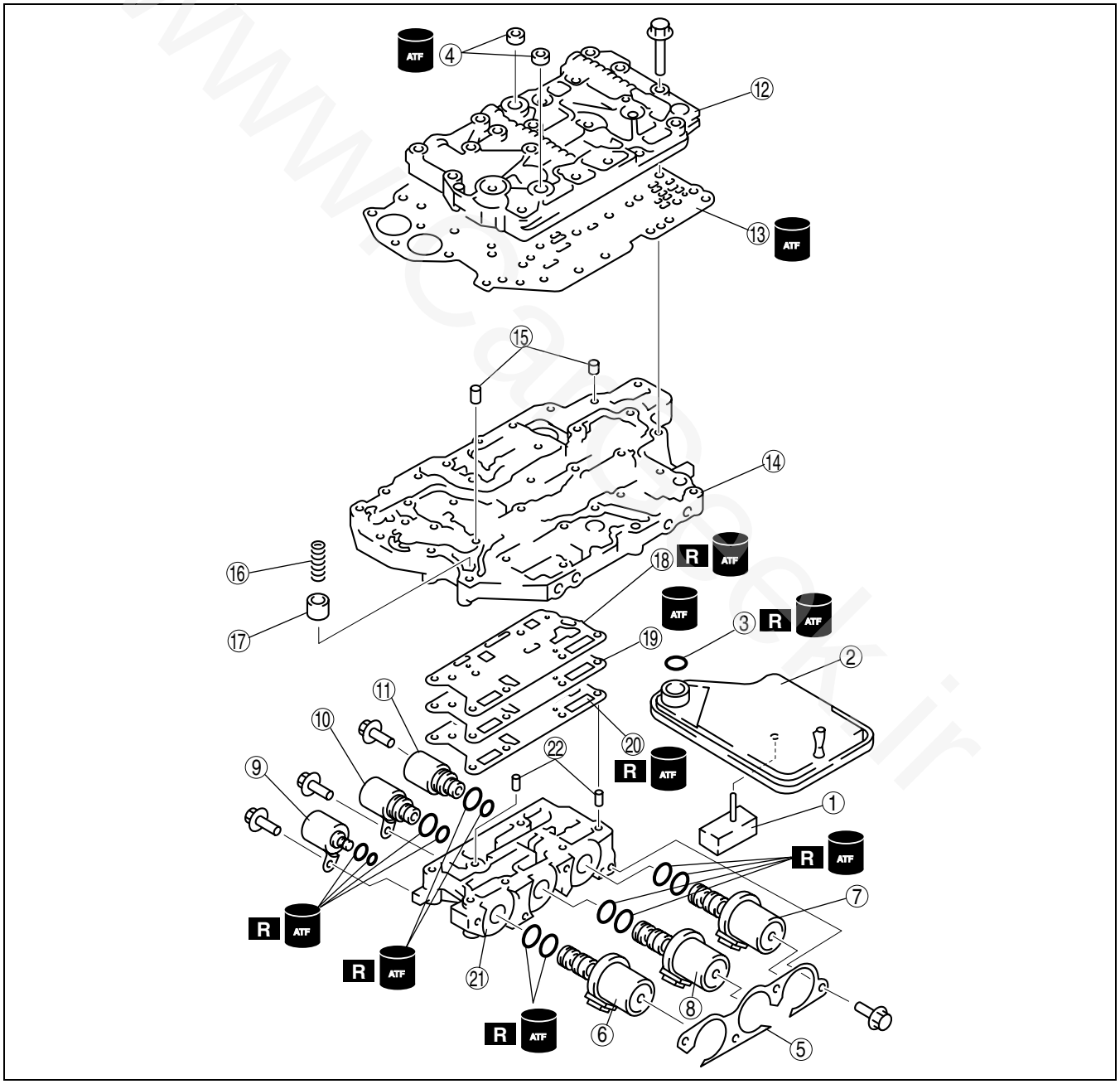
- **Denting or scratching these components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.**

1. Disassemble in the order indicated in the table.
2. Neatly arrange the removed parts to avoid confusing the similar parts.

Warning

- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

3. Clean the removed parts with cleaning solvent, then use compressed air to dry them. Use compressed air to clean out all holes and passages.



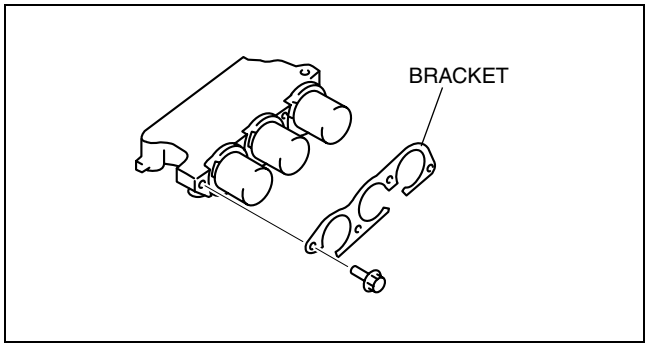
B3E0517A148

1	Transaxle fluid temperature sensor
2	Oil strainer

3	O-ring
4	Packing
5	Bracket
6	Shift solenoid A
7	Shift solenoid B
8	Shift solenoid C
9	Pressure control solenoid A
10	Shift solenoid D
11	Shift solenoid E
12	Upper control valve body
13	Seal plate
14	Main control valve body
15	Tubular pin
16	Pressure modifier accumulator spring
17	Pressure modifier accumulator
18	Gasket D
19	Separator plate
20	Gasket C
21	Solenoid control valve body
22	Tubular pin

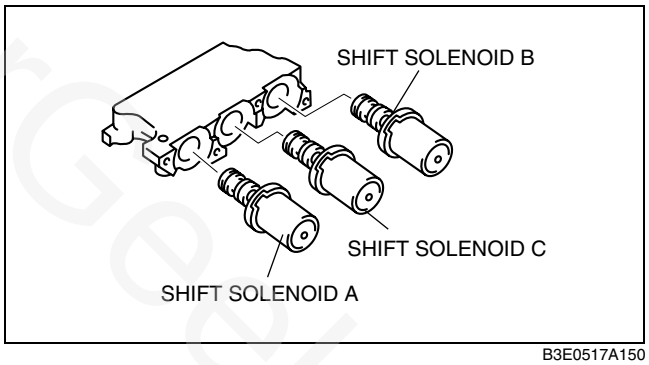
Disassembly procedure

1. Remove the oil strainer.
2. Remove the O-ring from the oil strainer.
3. Remove the packing.
4. Remove the bracket.



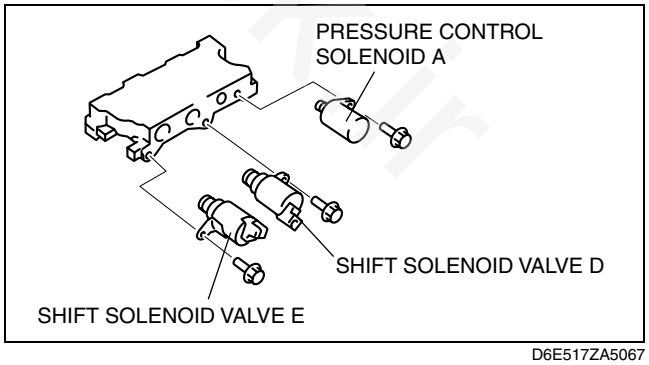
B3E0517A149

5. Remove the shift solenoid A, B, C.



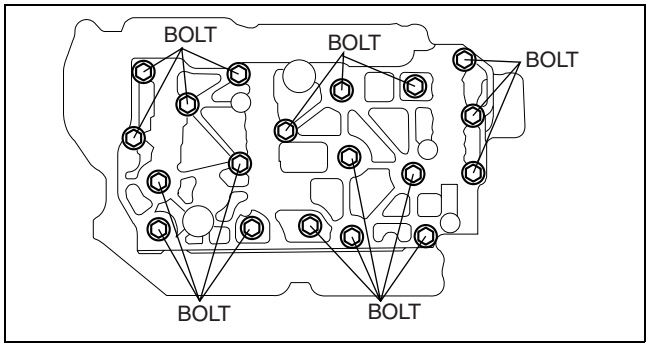
B3E0517A150

6. Remove the pressure control solenoid A, shift solenoid D, E.



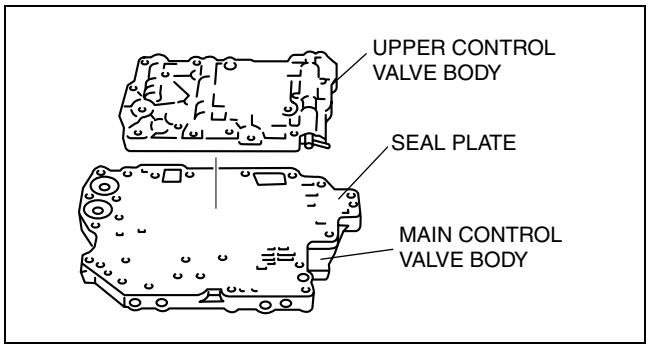
D6E517ZA5067

7. Loosen the bolts evenly in the pattern shown.



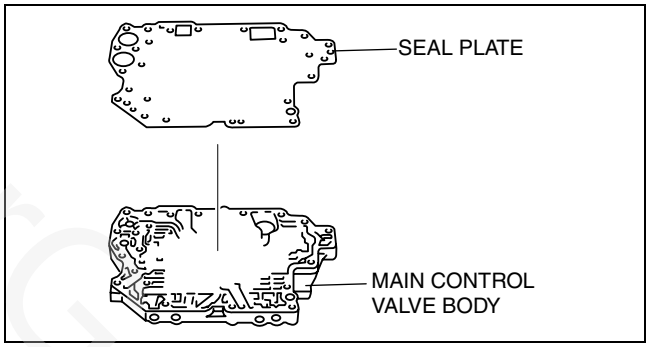
B3E0517A152

8. Remove the upper control valve body.



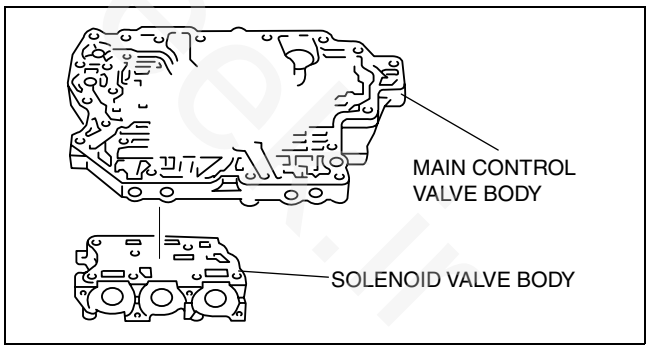
B3E0517A153

9. Remove the seal plate.



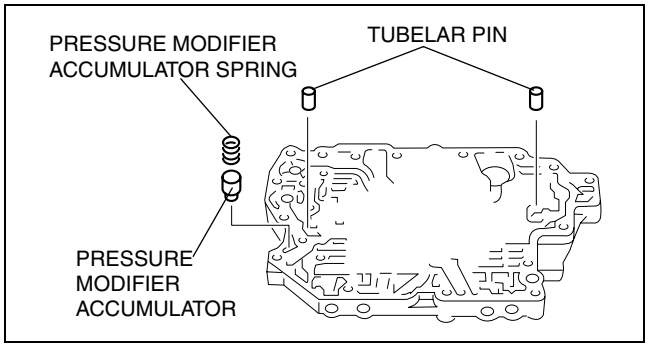
B3E0517A154

10. Remove the main control valve body.



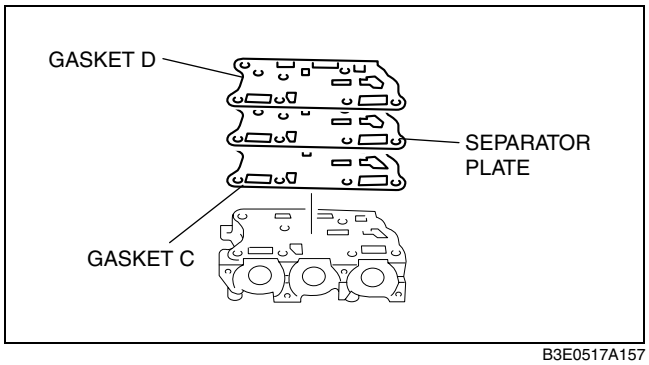
B3E0517A155

11. Remove the tubular pins, pressure modifier accumulator spring and pressure modifier accumulator from the main control valve body.



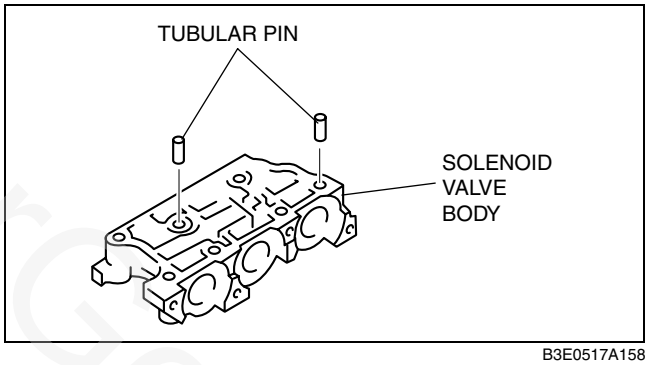
B3E0517A156

12. Remove the gasket D, separator plate and gasket C.



B3E0517A157

13. Remove the tubular pins.



B3E0517A158

Upper Control Valve Body Disassembly/Assembly

Caution

- **Denting or scratching these precisely machined components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.**

Note

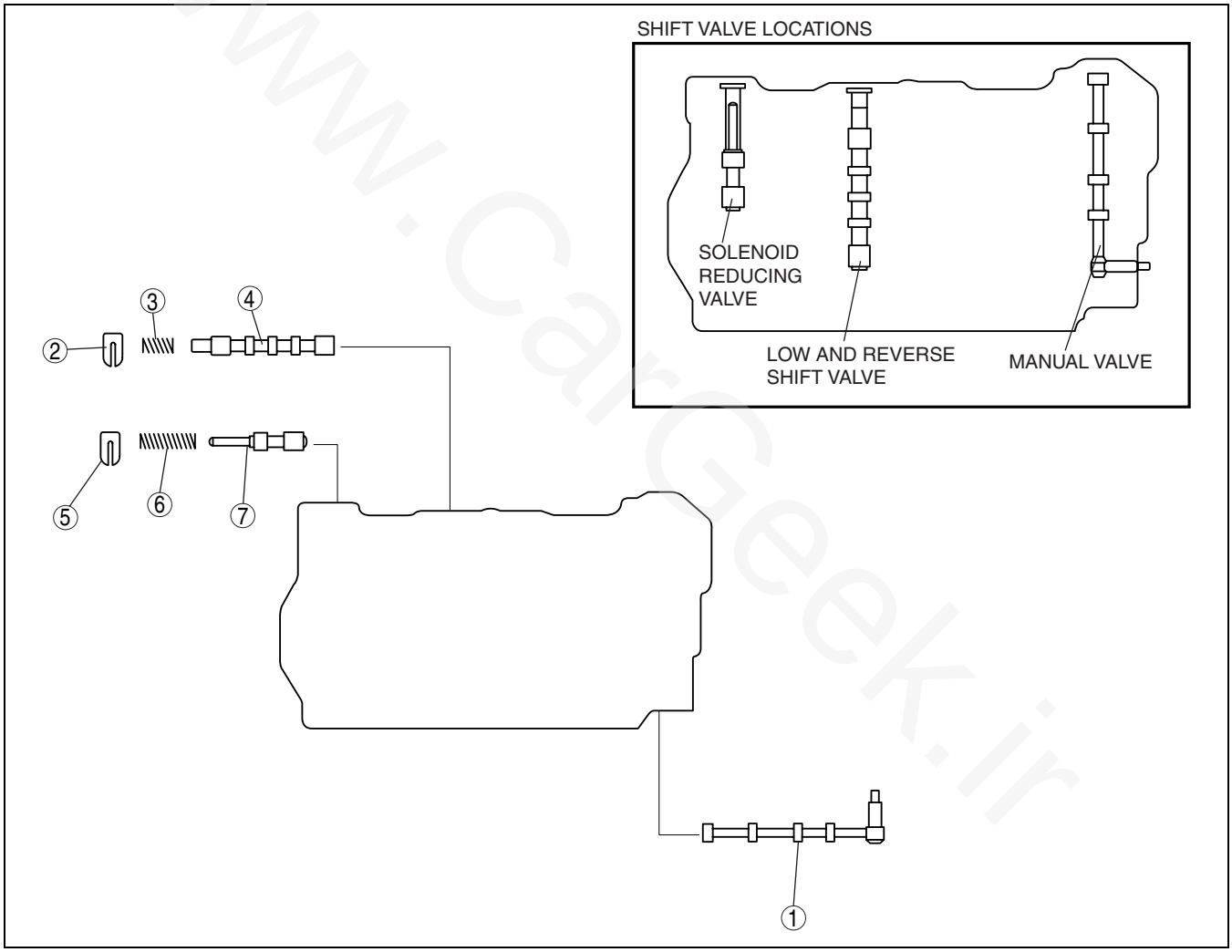
- If a valve does not slide out under its own weight, place the valve body open-side down and tap on the valve body lightly with a plastic hammer.

1. Disassemble in the order indicated in the table.

Warning

- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

2. Clean all parts and holes using compressed air and apply ATF to them immediately before assembly.
3. Assemble in the reverse order of disassembly.



B3E0517A159

1	Manual valve
2	Retainer
3	Low and reverse shift valve spring
4	Low and reverse shift valve

5	Retainer
6	Solenoid reducing valve spring
7	Solenoid reducing valve

Assembly procedure

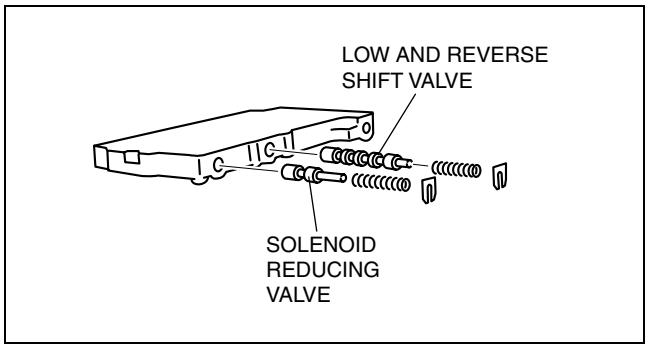
1. Measure the spring free length.

Primary control valve body spring (standard)

Item	Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
Low and reverse shift valve spring	8.7 {0.343}	31.3 {1.232}	9.0	0.8 {0.031}
Solenoid reducing valve spring	8.7 {0.343}	44.2 {1.740}	16.0	1.1 {0.043}

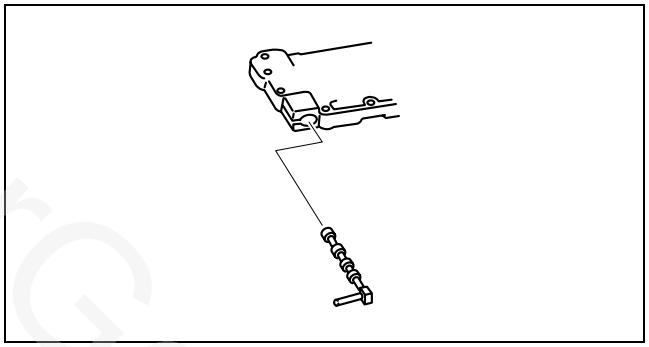
- If not as specified, replace the springs.

2. Install the solenoid reducing valve, solenoid reducing valve spring and retainer.
3. Install the low and reverse shift valve, low and reverse shift valve spring and retainer.



B3E0517A160

4. Install the manual valve.



B3E0517A161

Main Control Valve Body Disassembly/Assembly

Caution

- **Denting or scratching these precisely machined components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them be careful not to drop or hit them.**

Note

- If a valve does not slide out under its own weight, place the valve body open-side down and tap on the valve body lightly with a plastic hammer.

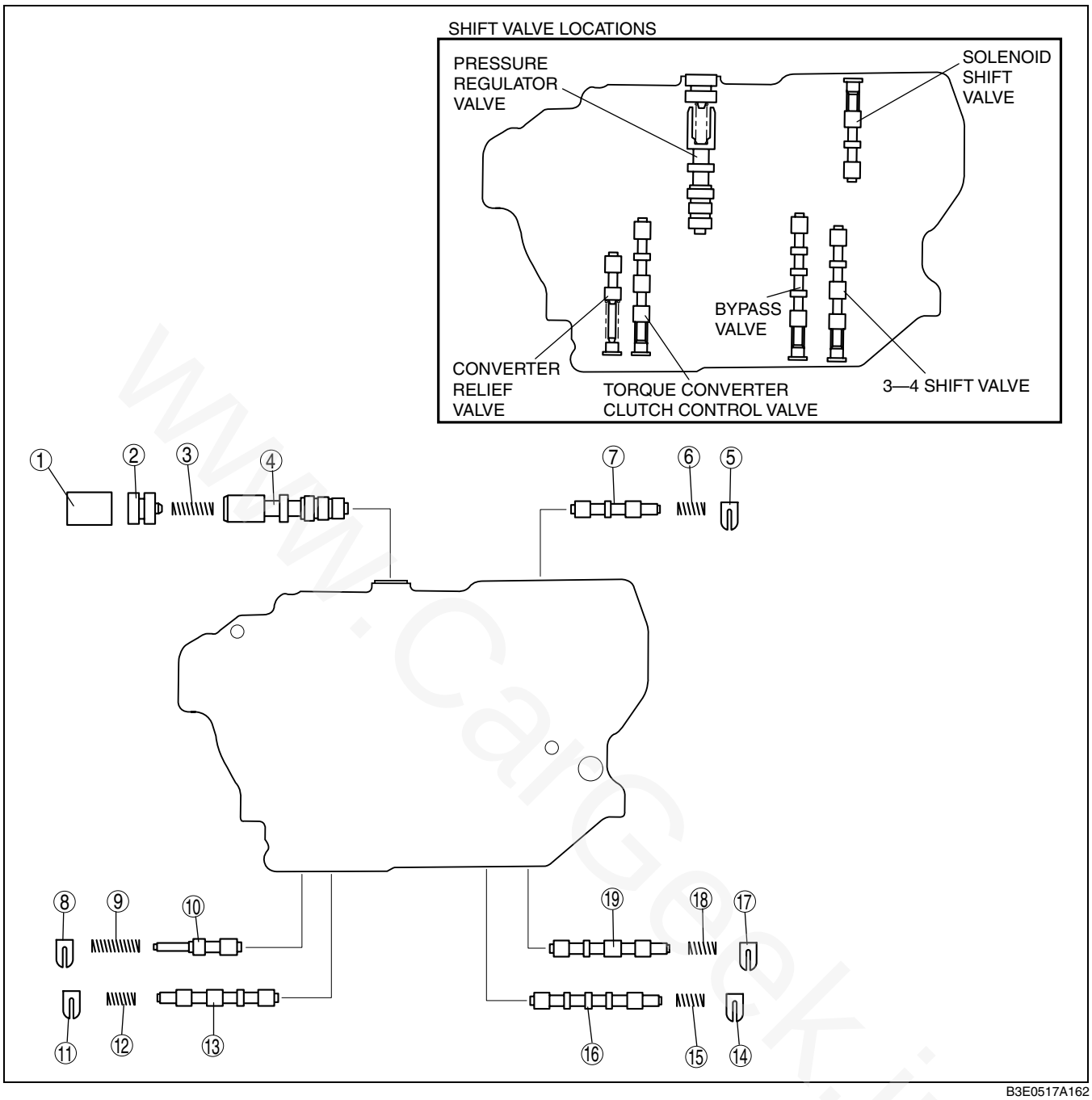
1. Disassemble in the order indicated in the table.

Warning

- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

2. Clean all parts and holes using compressed air and apply ATF to them immediately before assembly.

3. Assemble in the reverse order of disassembly.



B3E0517A162

1	Retainer
2	Stopper plug
3	Pressure regulator valve spring
4	Pressure regulator valve
5	Retainer
6	Solenoid shift valve spring
7	Solenoid shift valve
8	Retainer
9	Converter relief valve spring
10	Converter relief valve

11	Retainer
12	Torque converter clutch valve spring
13	Torque converter clutch valve
14	Retainer
15	Bypass valve spring
16	Bypass valve
17	Retainer
18	3–4 shift valve spring
19	3–4 shift valve

Assembly procedure

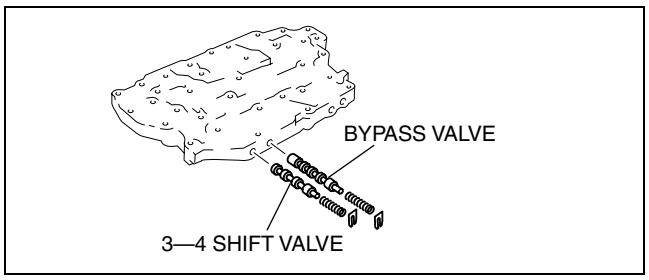
1. Measure the spring free length.

Primary control valve body spring (standard)

Item	Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
Pressure regulator valve spring	7.9 {0.311}	36.3 {1.429}	13.2	0.9 {0.035}
Solenoid shift valve spring	8.3 {0.327}	35.1 {1.382}	12.0	0.6 {0.024}
Converter relief valve spring	9.0 {0.354}	42.5 {1.673}	14.2	1.3 {0.051}
Torque converter clutch control valve spring	8.7 {0.343}	31.3 {1.232}	9.0	0.8 {0.031}
Bypass valve spring	8.7 {0.343}	31.3 {1.232}	9.0	0.8 {0.031}
3–4 shift valve spring	8.7 {0.343}	31.3 {1.232}	9.0	0.8 {0.031}

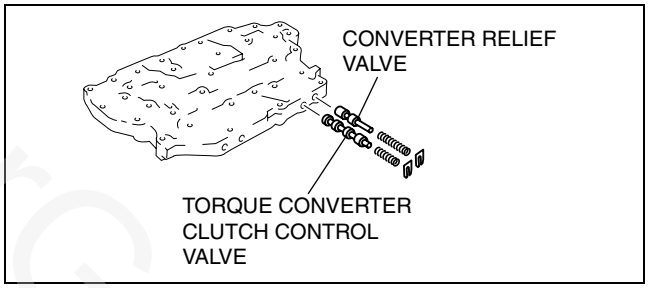
- If not as specified, replace the springs.

2. Install the 3–4 shift valve, 3–4 shift valve spring, and retainer.
3. Install the bypass valve, bypass valve spring, and retainer.
4. Install the torque converter clutch control valve, torque converter clutch control valve spring, and retainer.



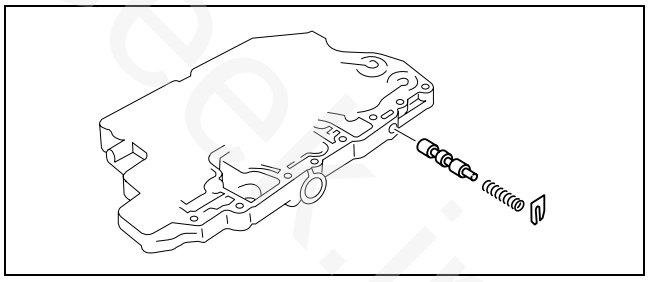
B3E0517A163

5. Install the converter relief valve, converter relief valve spring, and retainer.



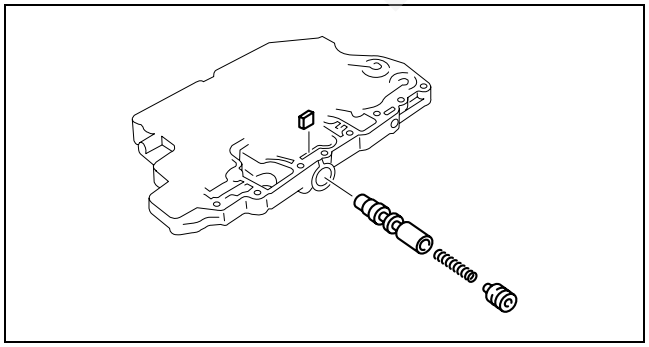
B3E0517A164

6. Install the solenoid shift valve, solenoid shift valve spring, and retainer.



B3E0517A165

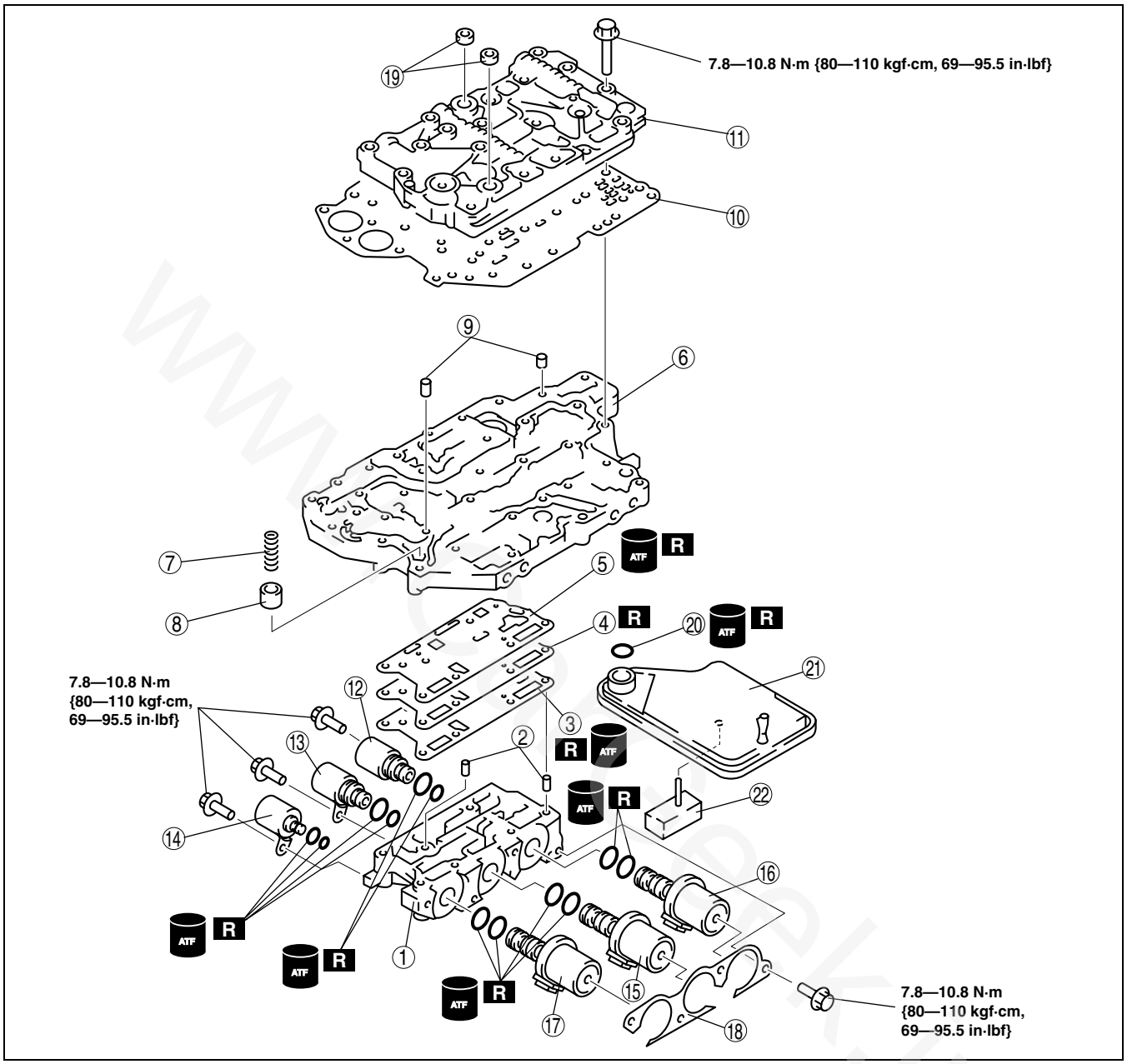
7. Install the pressure regulator valve, pressure regulator valve spring, and retainer.



B3E0517A166

Primary Control Valve Body Assembly

1. Verify that all parts are clean and free of dust and other small particles.
2. Apply ATF to all parts.
3. Assemble in the reverse order of disassembly.



B3E0517A167

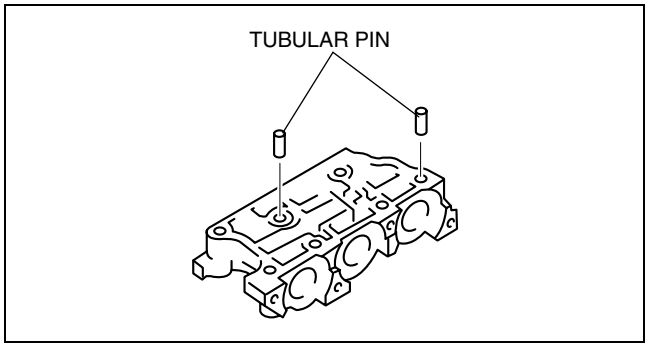
1	Solenoid control valve body
2	Tubular pin
3	Gasket C
4	Separator plate
5	Gasket D
6	Main control valve body
7	Pressure modifier accumulator spring
8	Pressure modifier accumulator
9	Tubular pin
10	Seal plate
11	Upper control valve body

12	Shift solenoid E
13	Shift solenoid D
14	Pressure control solenoid A
15	Shift solenoid C
16	Shift solenoid B
17	Shift solenoid A
18	Bracket
19	Packing
20	O-ring
21	Oil strainer
22	Transaxle fluid temperature sensor

Assembly procedure

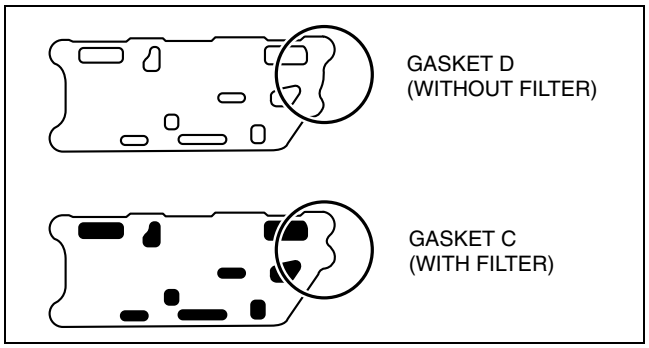
1. Install the tubular pins into the solenoid control valve body.

Caution
- **Do not confuse gaskets C and D.**



B3E0517A168

2. Set the new gasket C, separator plate, and new gasket D on the solenoid control valve body.
3. Install the pressure modifier accumulator and pressure modifier accumulator spring into the main control valve body.

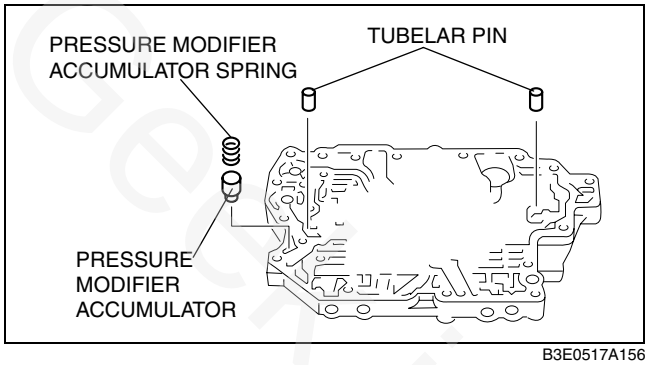


B3E0517A169

Primary control valve body spring (standard)

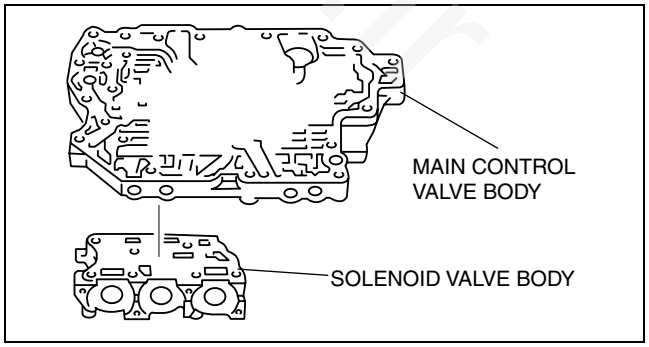
Item	Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
Pressure modifier accumulator spring	11.0 {0.433}	23.0 {0.906}	6.6	1.5 {0.059}

4. Install the tubular pins into the main control valve body.



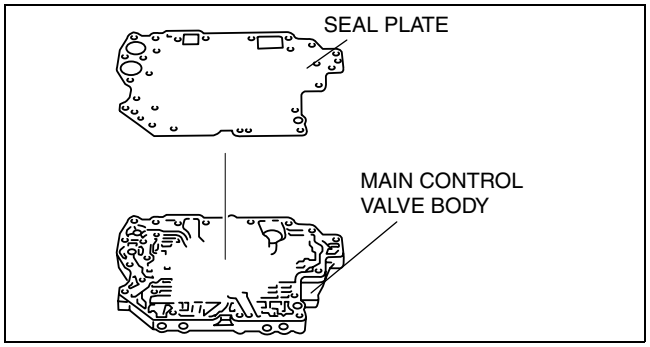
B3E0517A156

5. Set the main control valve body onto the solenoid control valve body.



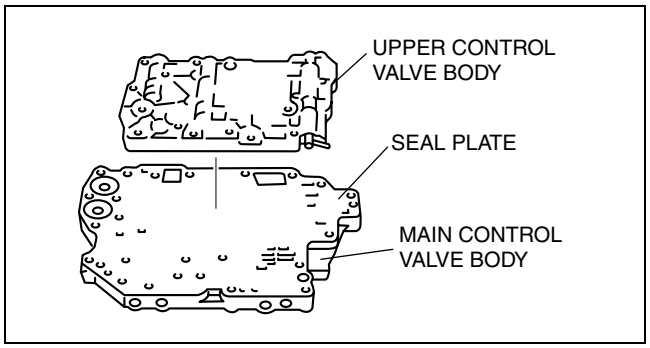
B3E0517A155

6. Set the seal plate on the main control valve body.



E6U517ZA6003

7. Set the upper control valve body onto the main control valve body.

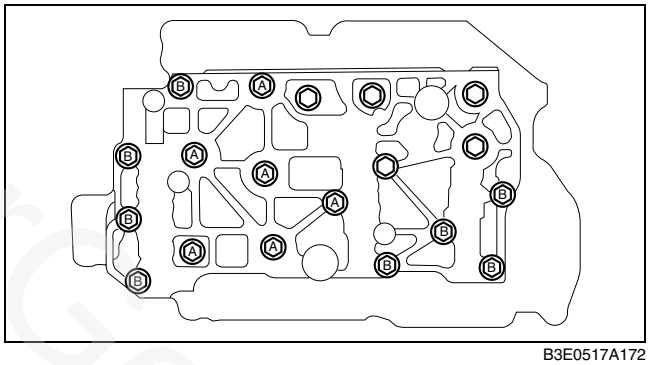


B3E0517A153

8. Hand-tighten the bolts shown in the figure. Each type of bolt has a different letter on its head. Match the bolt letter with the letter stamped next to its installation hole on the valve body.

Bolts identification

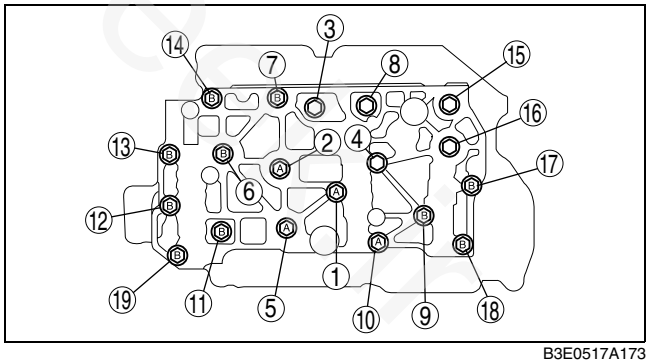
Identification mark	Length (measured from below the head) mm {in}
A	30 {1.181}
B	40 {1.575}
No mark	60 {2.362}



B3E0517A172

9. Tighten the bolts evenly and gradually in the order shown.

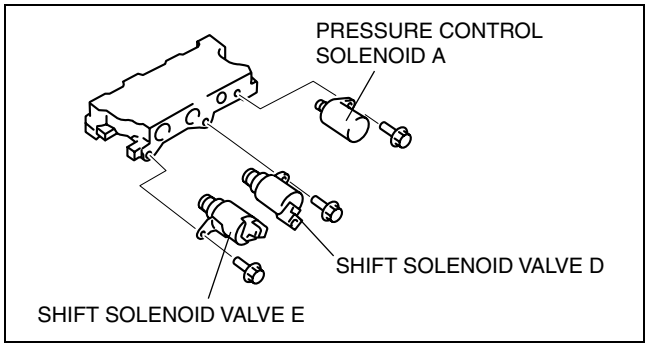
Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}



B3E0517A173

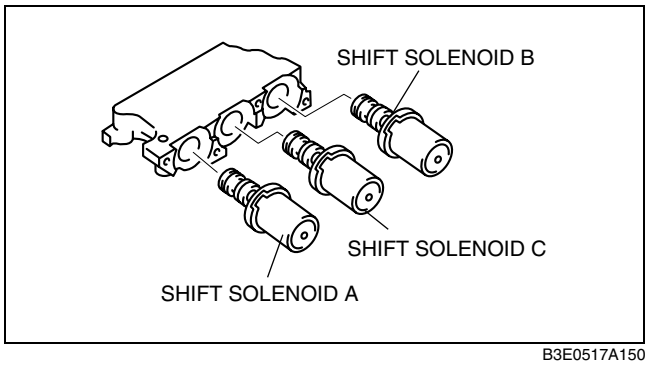
10. Install the shift solenoid D, E, and pressure control solenoid A.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}



D6E517ZA5067

11. Install the shift solenoid A, B, C.

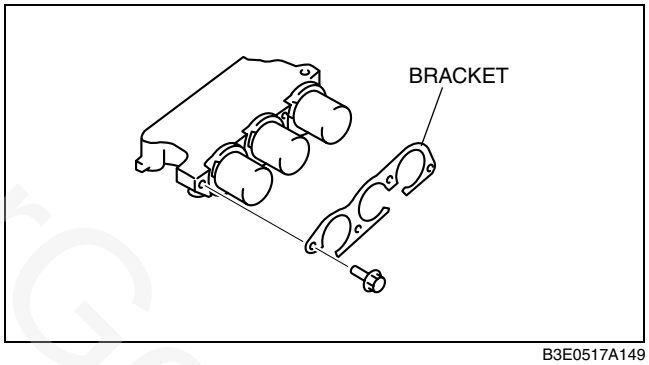


B3E0517A150

12. Install the bracket.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}

13. Install the packing.
14. Apply ATF to new O-ring and install it onto the oil strainer.
15. Install the oil strainer onto the main control valve body.



B3E0517A149

SECONDARY CONTROL VALVE BODY DISASSEMBLY/ASSEMBLY

E6U051721100A04

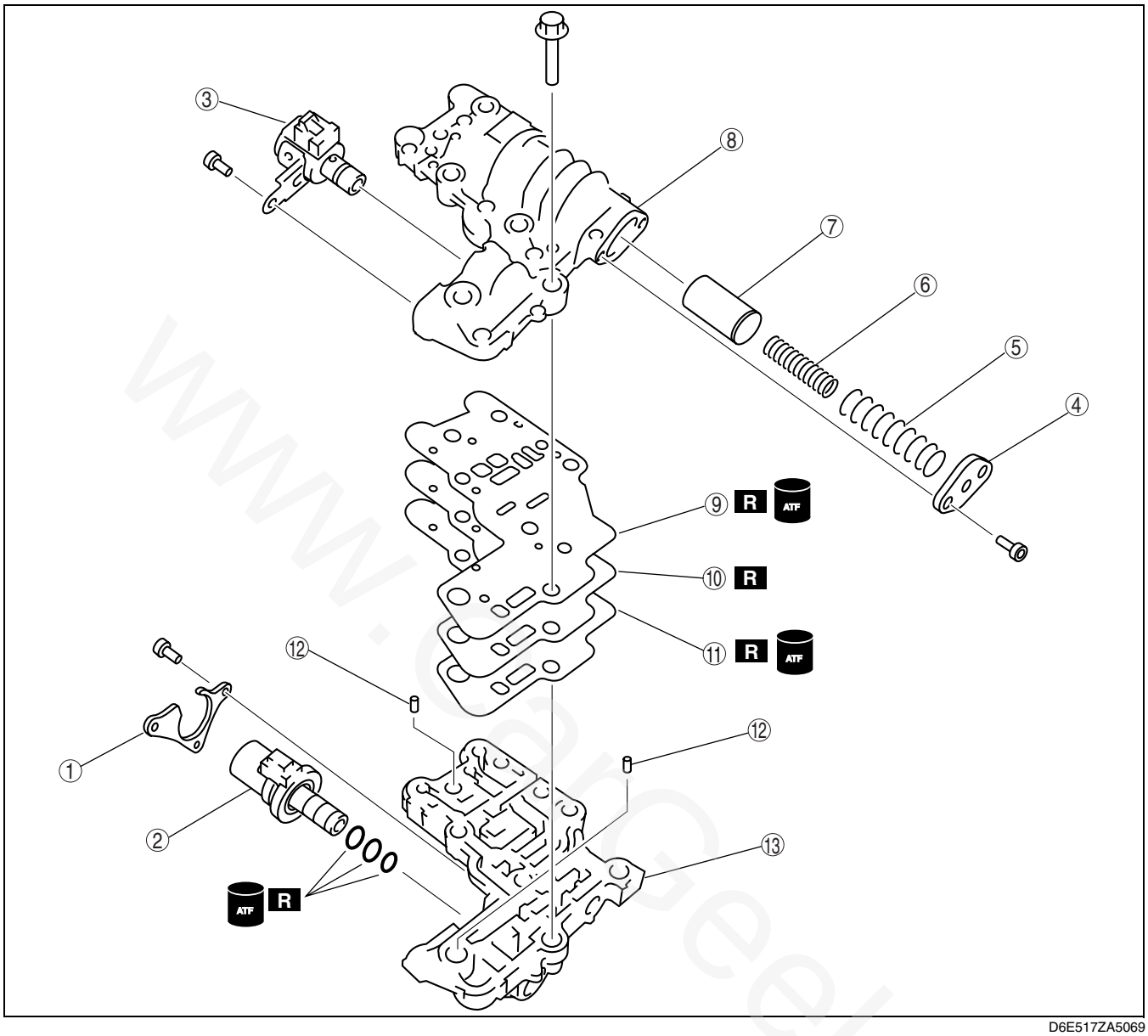
Secondary Control Valve Body Disassembly

Caution
- **Denting or scratching these components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.**

1. Disassemble in the order indicated in the table.
2. Neatly arrange the removed parts to avoid confusing the similar parts.

Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

3. Clean the removed parts with cleaning solvent, then use compressed air to dry them. Use compressed air to clean out all holes and passages.



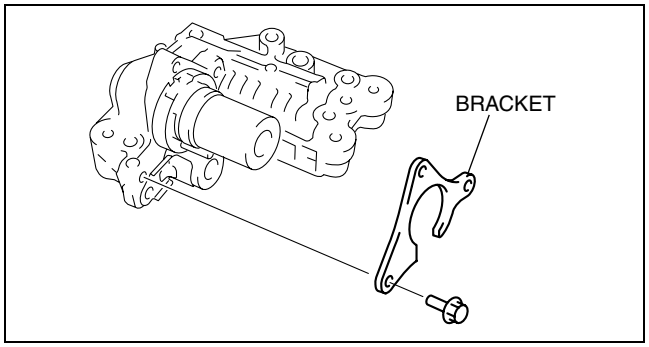
D6E517ZA5069

1	Bracket
2	Pressure control solenoid B
3	Shift solenoid F
4	4/5 accumulator plate
5	4/5 accumulator large spring
6	4/5 accumulator small spring
7	4/5 accumulator

8	Secondary lower control valve body
9	Gasket G
10	Separator plate
11	Gasket H
12	Tubular pin
13	Secondary main control valve body

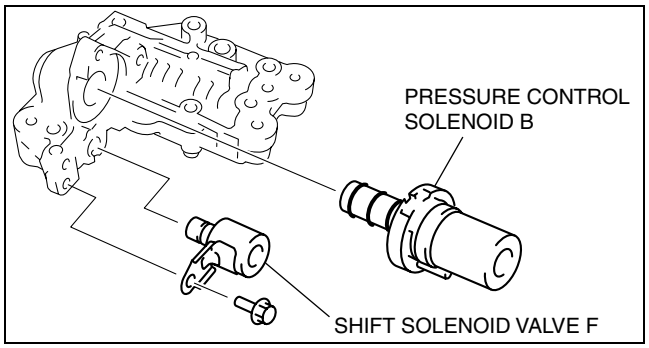
Disassembly procedure

1. Remove the bracket.



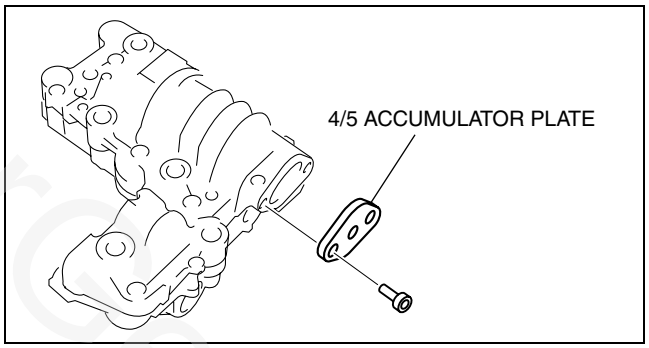
D6E517ZA5070

2. Remove the pressure control solenoid B and shift solenoid F.



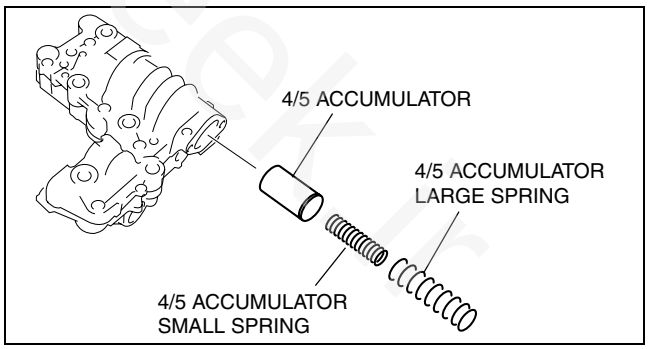
D6E517ZA5071

3. Remove the 4/5 accumulator plate.



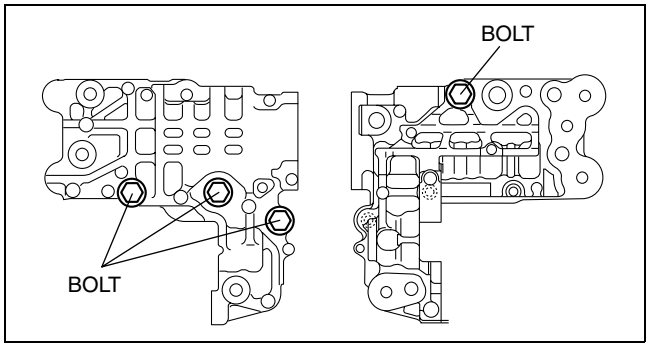
D6E517ZA5072

4. Remove the 4/5 accumulator large spring, 4/5 accumulator small spring and 4/5 accumulator.



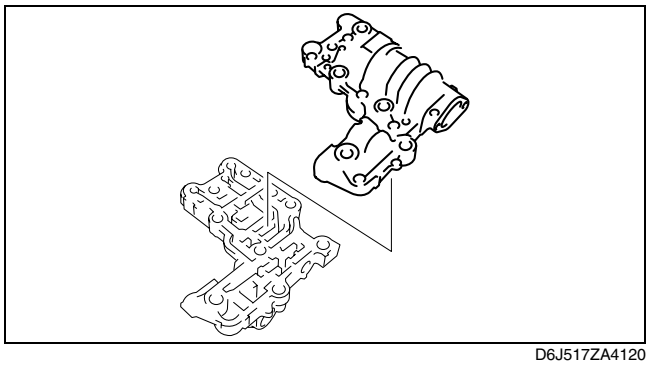
D6E517ZA5073

5. Loosen the bolts evenly in the pattern shown.



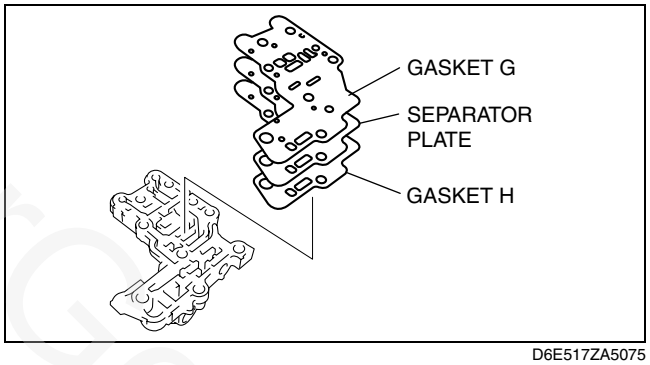
D6E517ZA5074

6. Remove the secondary lower control valve body.



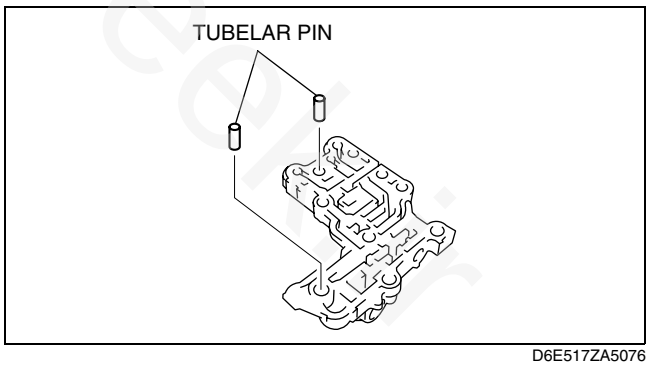
D6J517ZA4120

7. Remove the gasket G, separator plate and gasket H.



D6E517ZA5075

8. Remove the tubular pins.



D6E517ZA5076

Secondary Main Control Valve Body Disassembly/Assembly

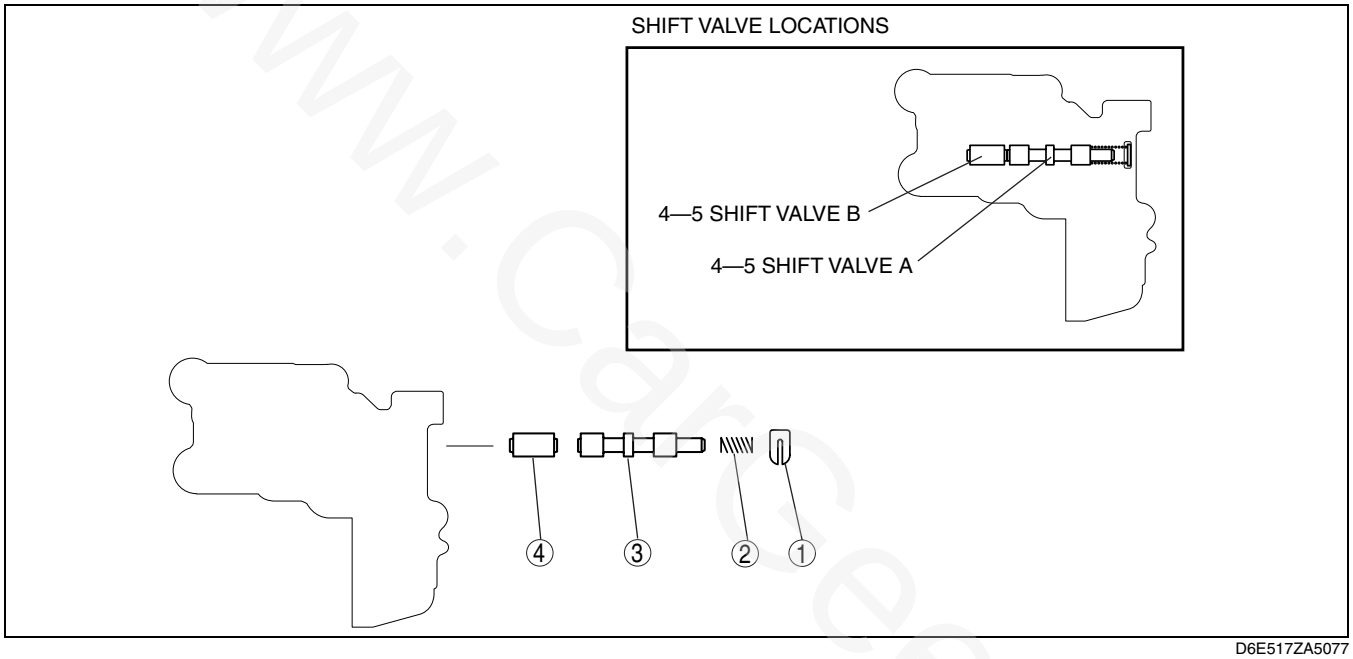
Caution
- **Denting or scratching these precisely machined components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them be careful not to drop or hit them.**

Note
- If a valve does not slide out under its own weight, place the valve body open-side down and tap on the valve body lightly with a plastic hammer.

1. Disassemble in the order indicated in the table.

Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

2. Clean all parts and holes using compressed air and apply ATF to them immediately before assembly.
3. Assemble in the reverse order of disassembly.



D6E517ZA5077

1	Retainer
2	4–5 shift valve spring
3	4–5 shift valve A
4	4–5 shift valve B

Assembly procedure

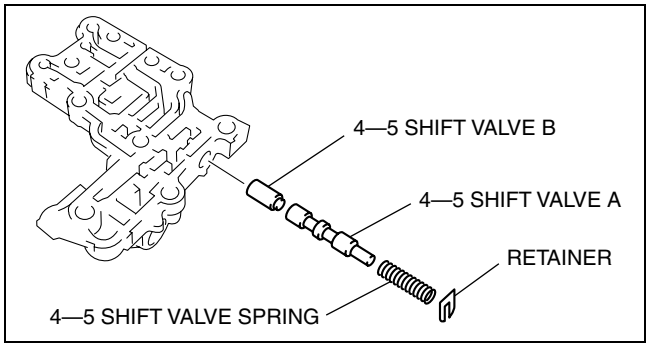
1. Measure the spring free length.

Secondary control valve body spring (standard)

Item	Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
4–5 shift valve spring	8.7 {0.343}	27.0 {1.063}	10.7	0.8 {0.031}

- If not as specified, replace the springs.

2. Install the 4–5 shift valve B, 4–5 shift valve A, 4–5 shift valve spring and retainer.

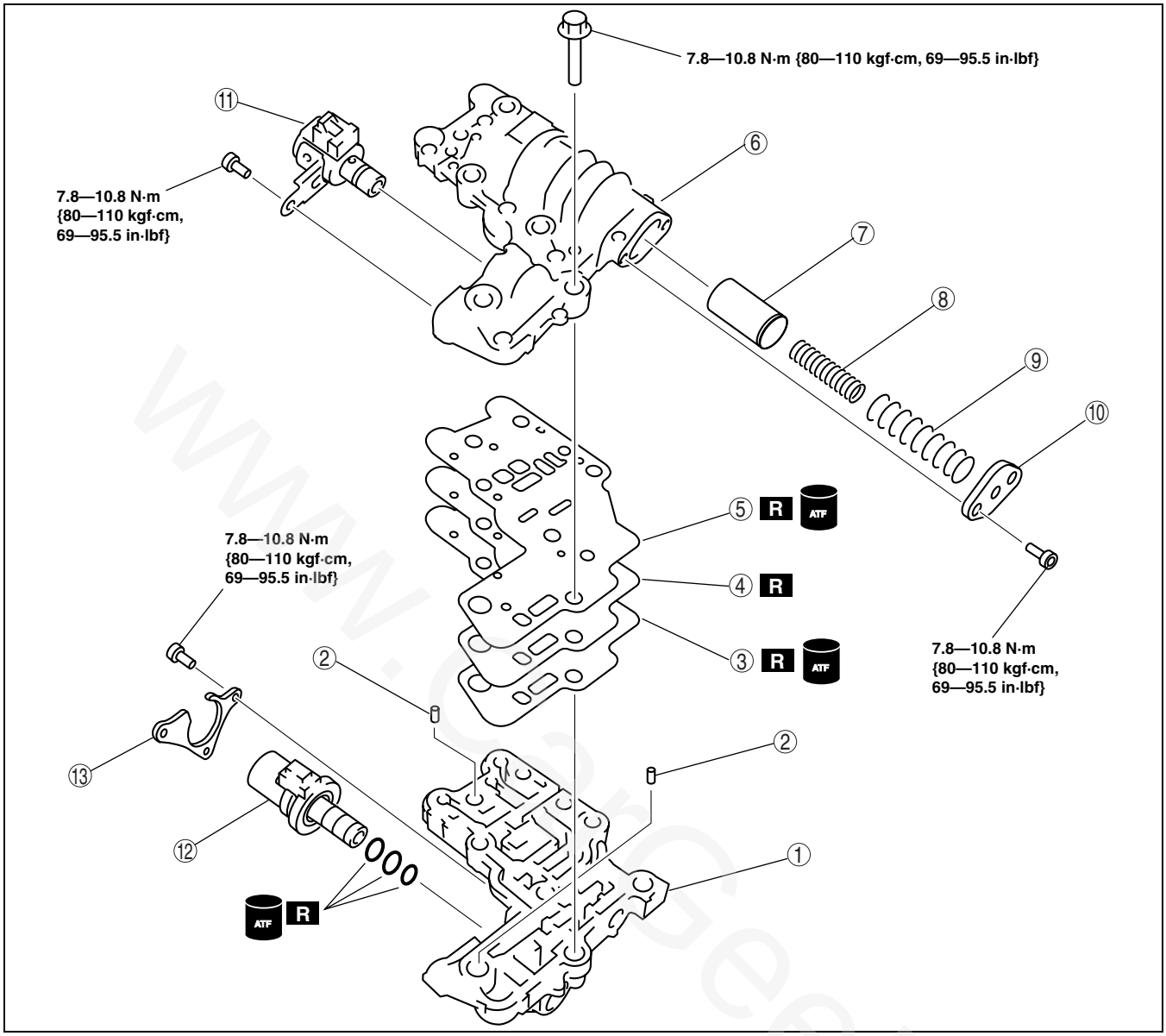


D6E517ZA5078

Secondary Control Valve Body Assembly

1. Verify that all parts are clean and free of dust and other small particles.
2. Apply ATF to all parts.

3. Assemble in the reverse order of disassembly.



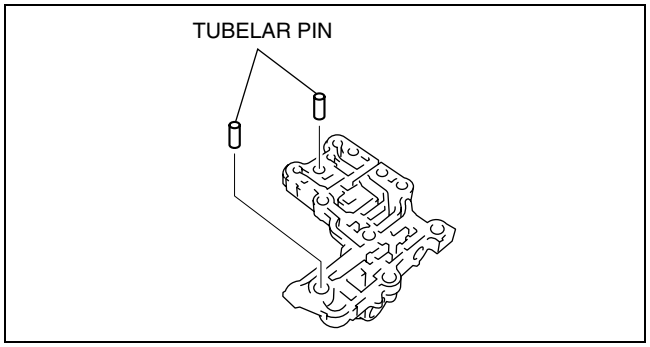
D6E517ZA5068

1	Secondary main control valve body
2	Tubular pin
3	Gasket H
4	Separator plate
5	Gasket G
6	Secondary lower control valve body
7	4/5 accumulator

8	4/5 accumulator small spring
9	4/5 accumulator large spring
10	4/5 accumulator plate
11	Shift solenoid F
12	Pressure control solenoid B
13	Bracket

Assembly procedure

1. Install the tubular pins into the secondary main control valve body.

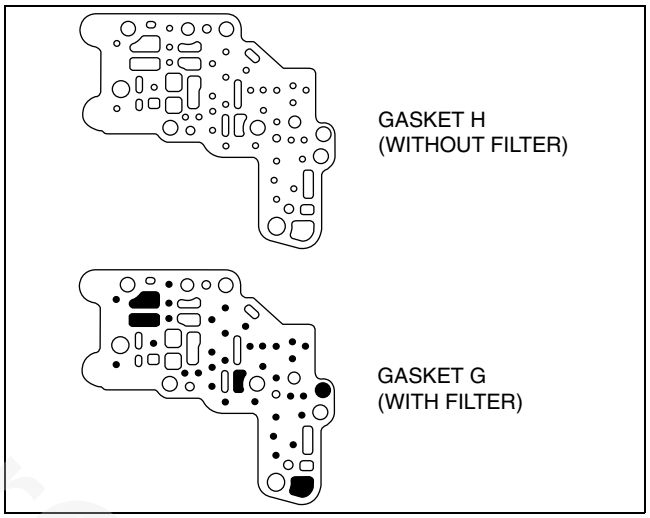


D6E517ZA5076

Caution

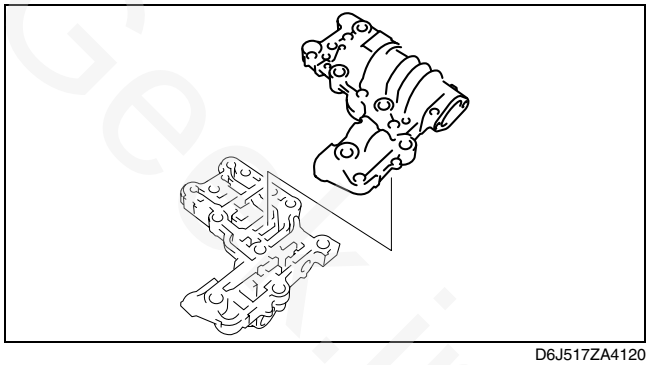
Do not confuse gaskets G and H.

2. Set the new gasket H, separator plate, and new gasket G on the secondary main control valve body.



D6E517ZA5079

3. Set the secondary lower control valve body onto the secondary main control valve body.

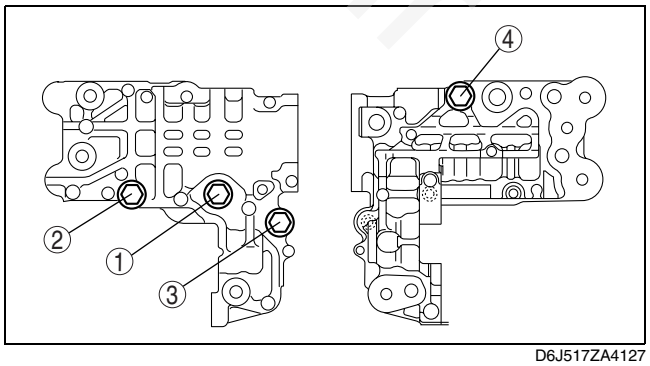


D6J517ZA4120

4. Tighten the bolts evenly and gradually in the order shown.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}

5. Measure the spring free length.



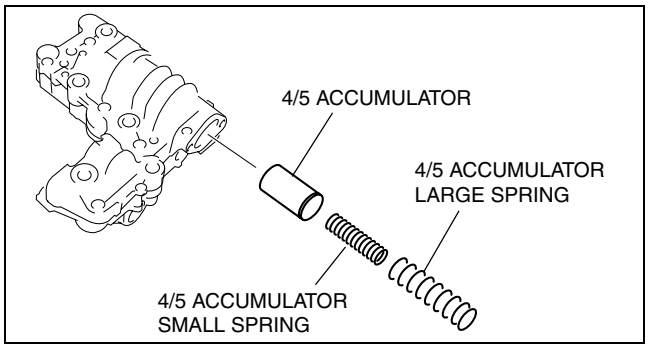
D6J517ZA4127

Secondary control valve body spring (standard)

Item	Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
4/5 accumulator large spring	21.2 {0.835}	72.2 {2.843}	14.0	2.6 {0.102}
4/5 accumulator small spring	15.2 {0.598}	53.7 {2.114}	11.9	3.2 {0.126}

- If not as specified, replace the springs.

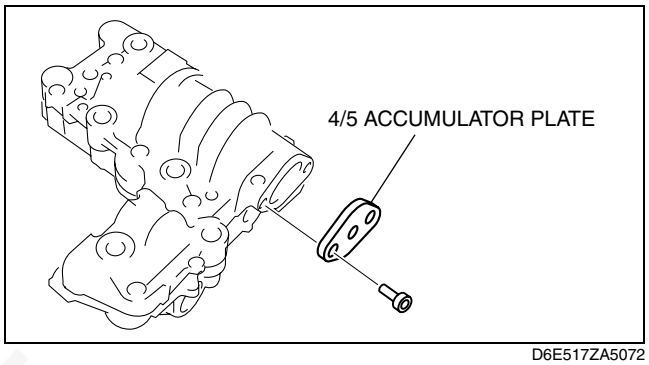
6. Install the 4/5 accumulator, 4/5 accumulator small spring and 4/5 accumulator large spring.



D6E517ZA5073

7. Install the 4/5 accumulator plate.

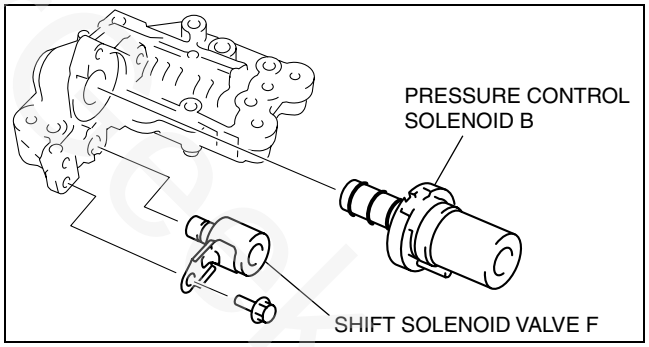
Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}



D6E517ZA5072

8. Install the shift solenoid F and pressure control solenoid B.

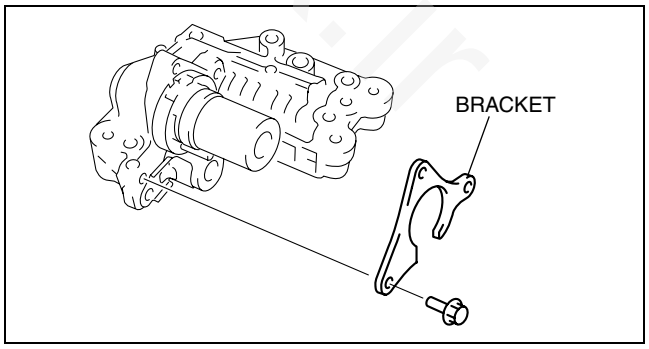
Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}



D6E517ZA5071

9. Install the bracket.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}



D6E517ZA5070

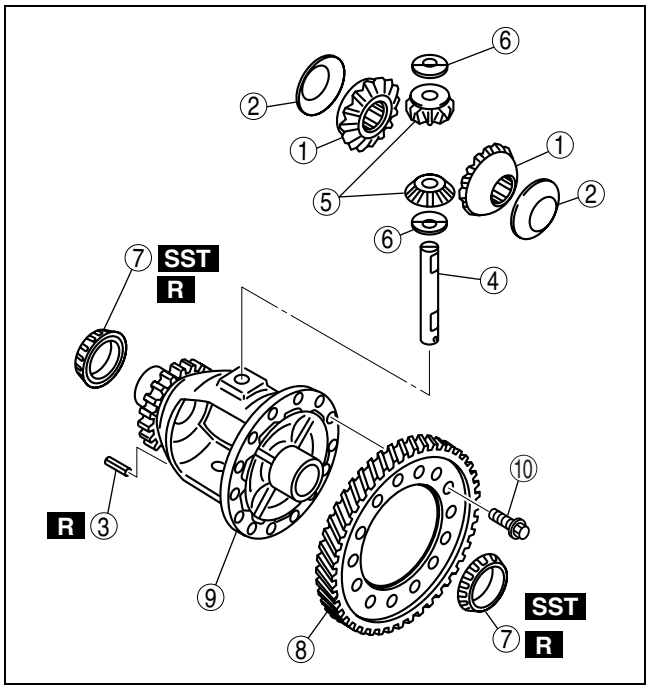
DIFFERENTIAL DISASSEMBLY/ASSEMBLY

E6U051727100A01

Differential Disassembly

1. Perform the preinspeciton before disassembly. (See 05–17–115 Differential Preinspection.)
2. Disassemble in the order indicated in the table.

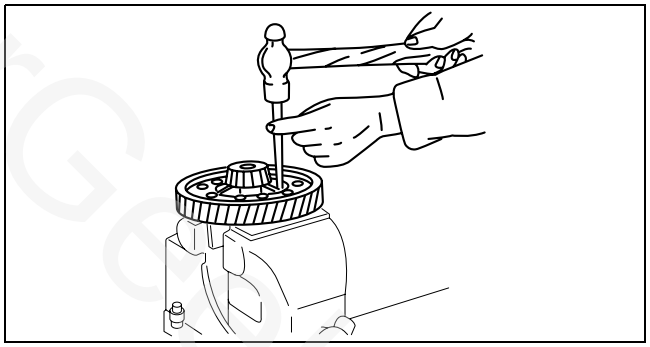
1	Side gear
2	Thrust washer
3	Roll pin (See 05–17–75 Roll pin disassembly note.)
4	Pinion shaft
5	Pinion gear
6	Thrust washer
7	Bearings (See 05–17–75 Bearings disassembly note.)
8	Ring gear
9	Gear case
10	Bolt



D6E517ZA5060

Roll pin disassembly note

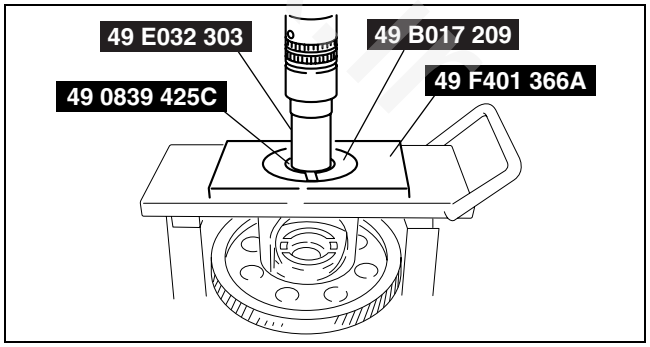
1. Place the gear case in a vise.
2. Insert a **2.0 mm {0.07 in}** punch into the roll pin hole from the ring gear side, and remove the roll pin.



B3E0517A268

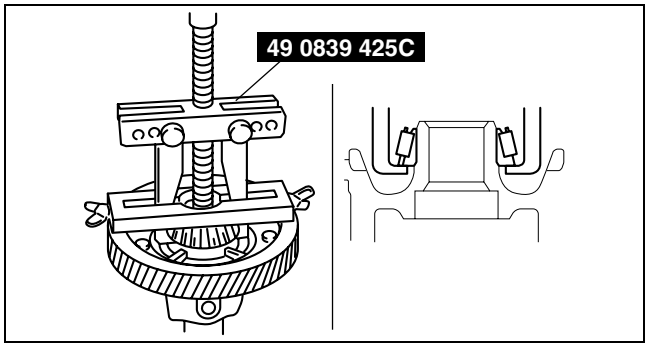
Bearings disassembly note

1. Remove the bearing (speedometer drive gear side) from the gear case using the **SSTs**.



D6J517ZA4161

2. Remove the bearing (ring gear side) from the gear case using the **SST**.

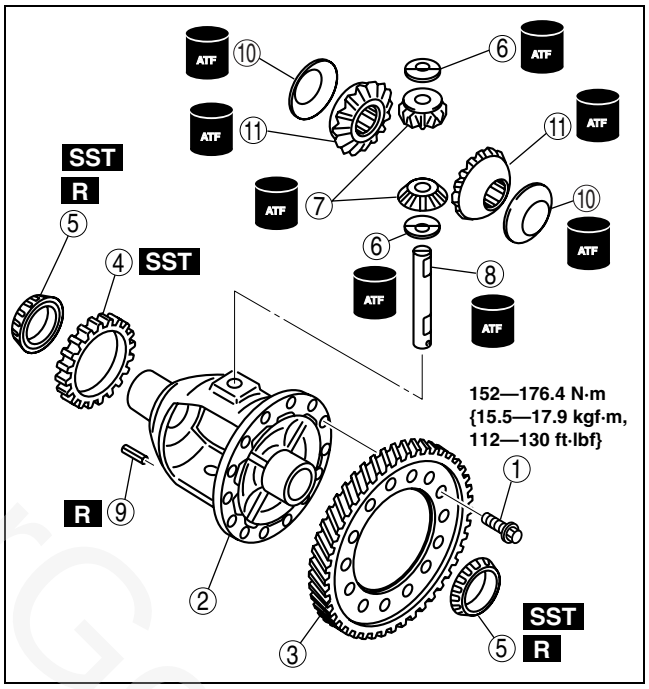


B3E0517A270

Differential Assembly

1. Assemble in the reverse order of disassembly.

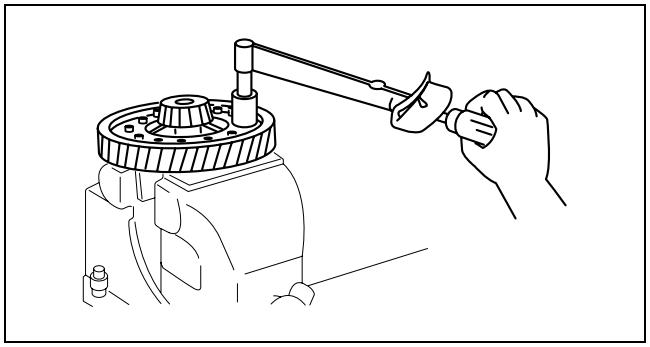
1	Bolt
2	Gear case
3	Ring gear
4	Sensor rotor
5	Bearings
6	Thrust washer
7	Pinion gear
8	Pinion shaft
9	Roll pin
10	Thrust washer
11	Side gear



D6E517ZA5061

Assembly Procedure

1. Install the ring gear to the gear case.

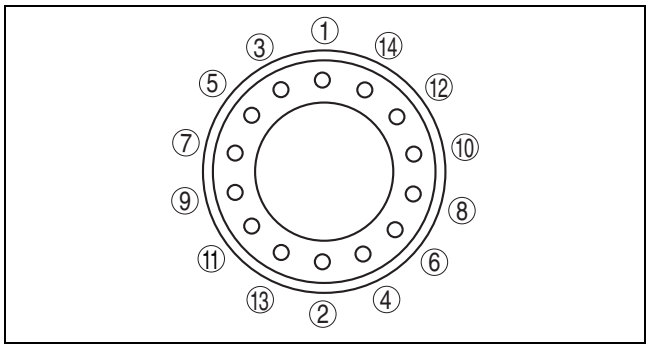


B3E0517A272

2. Tighten the bolts evenly and gradually in the order shown. (bolt fixed type)

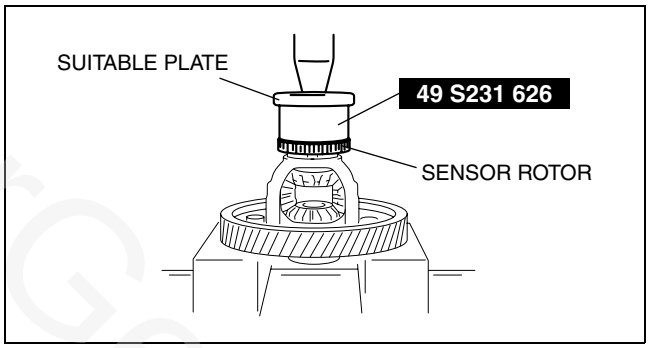
   Tightening torque
   152—176.4 N·m
   {15.5—17.9 kgf·m, 112—130 ft·lbf}

   Note
   - If the gear case has been newly replaced perform Step (3).



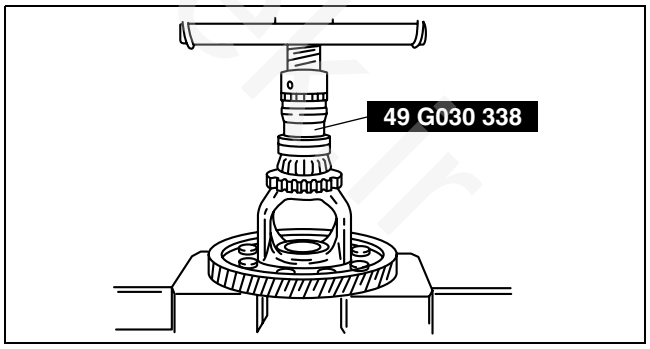
B3E0517A273

3. Install the sensor rotor to the gear case using the **SST** and suitable plate.



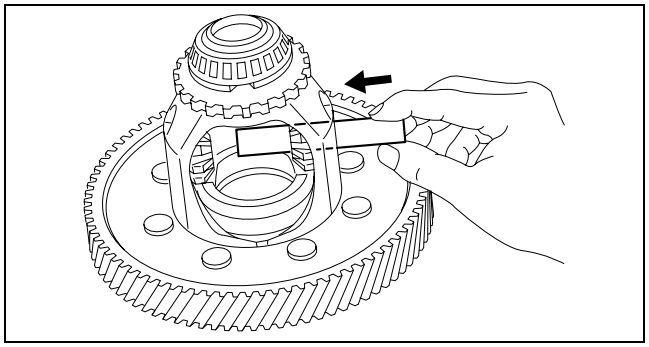
B3E0517A274

4. Install a new bearing.
   (1) Press the new bearing (sensor rotor side) onto the gear case using the **SST**.
   (2) Press on the other new bearing (ring gear side) in the same manner.
5. Apply ATF to the thrust washers and pinion shaft.
6. Install the pinion gear and thrust washers into the gear case.



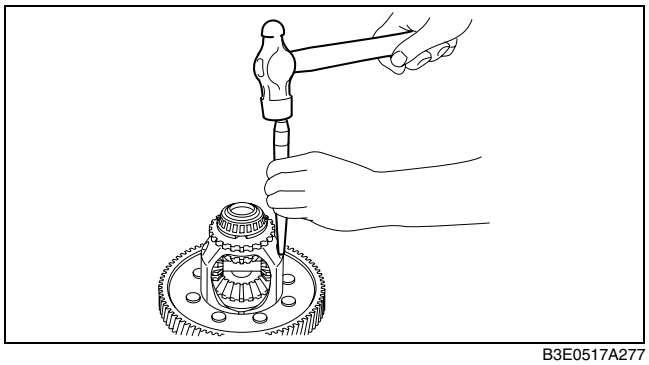
B3E0517A275

7. Install the pinion shaft.



B3E0517A276

8. Install the roll pin, and crimp it to prevent it from coming out of the gear case.
9. Apply ATF to the thrust washers.
10. Install the thrust washers and side gears into the gear case, then turn the side gears and align them with the drive shaft holes.

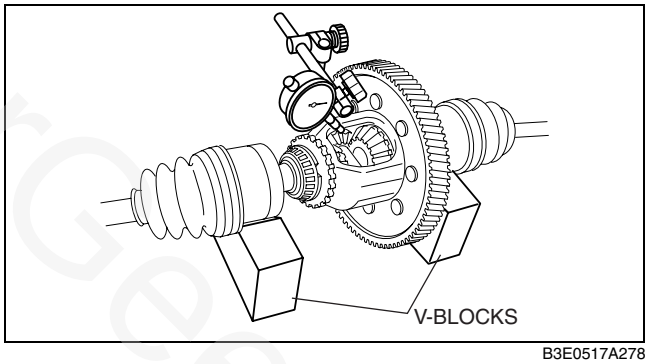


B3E0517A277

11. Measure the backlash of the side gears as follows:
    (1) Install the left and right drive shafts in the differential.
    (2) Support the drive shafts on V-blocks.
    (3) Measure the backlash of both side gears.

    Differential backlash
    Standard: 0.05—0.15 mm {0.002—0.005 in}
    Maximum: 0.5 mm {0.020 in}

- If not as specified, replace the differential.

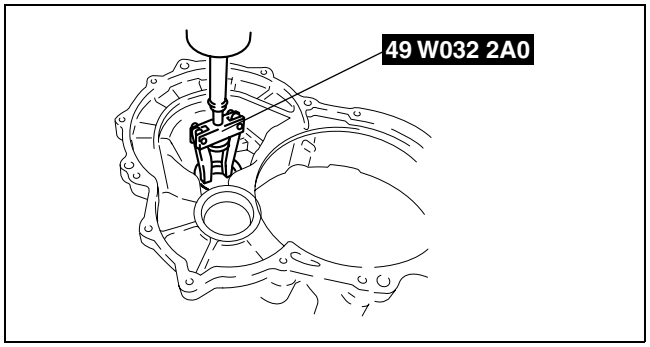


B3E0517A278

DIFFERENTIAL BEARING PRELOAD

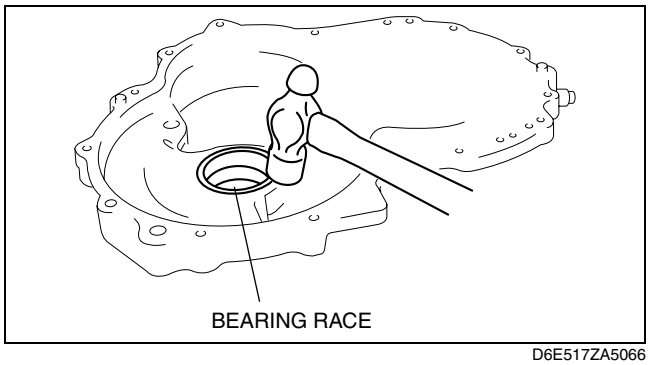
1. Remove the bearing race and adjustment shim from the converter housing using the **SST**.

E6U051727100A02



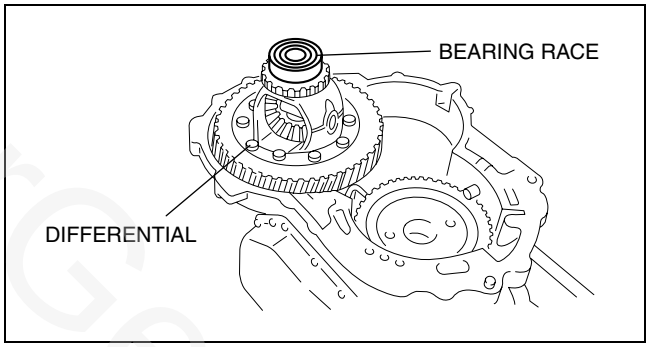
B3E0517A186

2. Install the bearing race into the transaxle case.



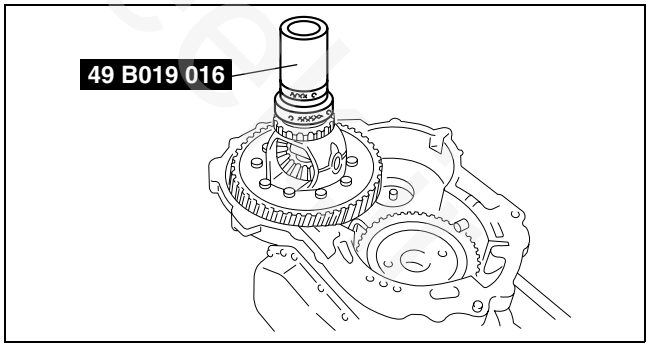
D6E517ZA5066

3. Set the differential on the transaxle case.
4. Install the bearing race removed in Step 1 into the **SST**.



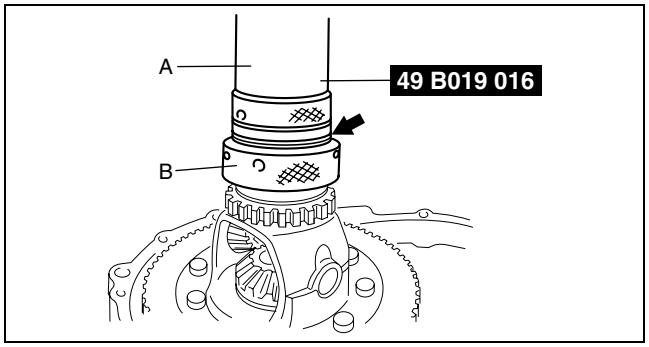
D6E517ZA5062

5. Set the differential on the **SST** (selector).



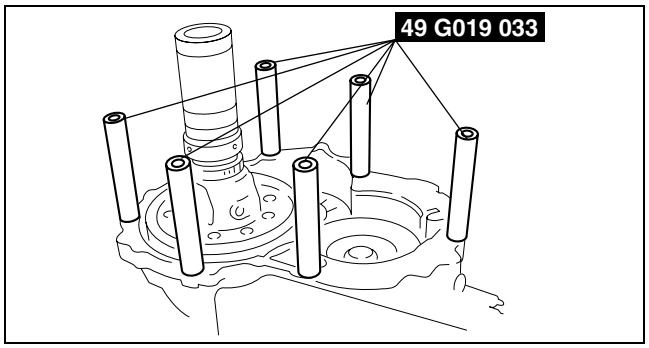
B3E0517A190

6. Turn the selector to eliminate the gap between its two halves.



D6J517ZA4164

7. Set the six **SSTs** (collars) on the transaxle case in the position shown.

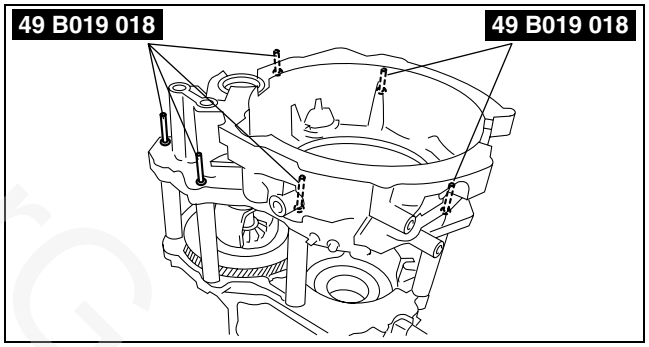


B3E0517A191

8. Set the converter housing on the transaxle case and tighten the **SSTs** (bolts) to the specified torque.

   Tightening torque
   19—25 N·m {1.9—2.6 kgf·m, 14—18 ft·lbf}

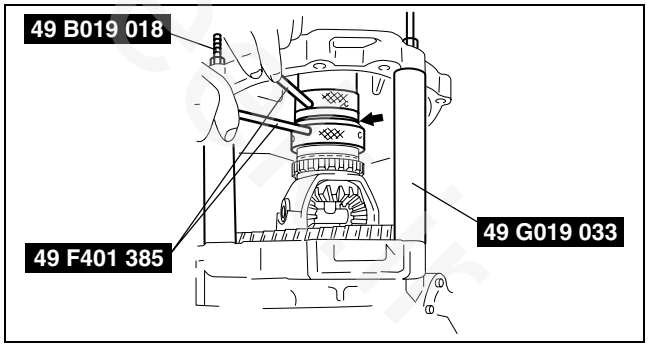
9. Turn the **SST** (selector) to increase the clearance (arrow) using the **SSTs** (bars), until it no longer turns. This is to seat the bearing race.



D6J517ZA4171

10. Turn the selector in the opposite direction until the preload is eliminated (gap is reduced).
11. Insert the **SST** through the converter housing and attach it to the pinion shaft.
12. Install the **SST** and a pull scale or torque wrench.

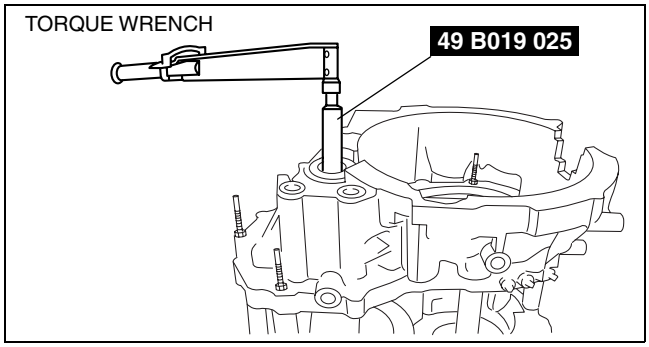
    Note
    - Read the preload when the differential starts to turn.
    - Measure several times and calculate the average value.



D6J517ZA4165

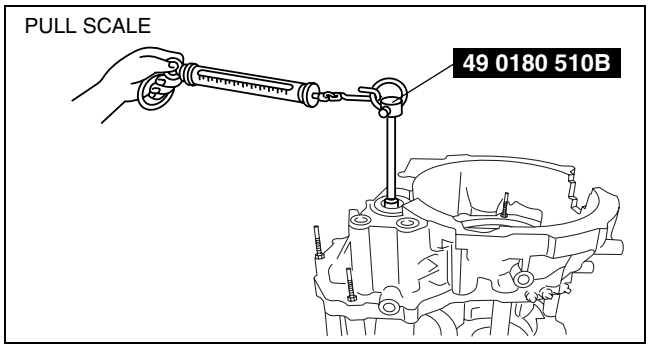
13. Adjust the clearance of the SST (selector) to obtain the specified preload/pull scale reading.

Differential bearing Preload
Preload: 1.4—2.3 N·m {14—24 kgf·cm, 12—20 in·lbf}
Reading on pull scale: 14—23 N {1.4—2.4 kgf, 3.1—5.3 lbf}



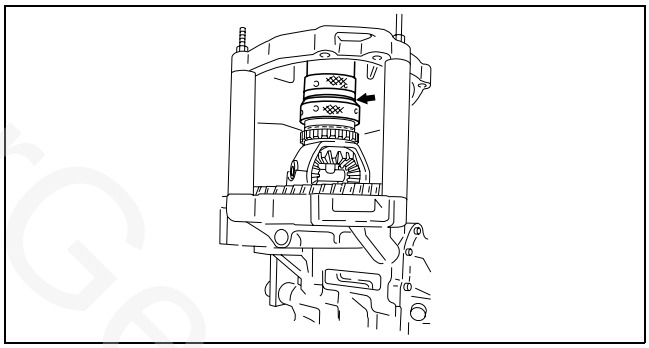
D6E517ZA5065

Note
- Measure the clearance around the entire circumference, and select a shim based on the maximum clearance.
- The maximum allowable number of adjustment shim is one.



D6E517ZA5064

14. Measure the clearance as shown.
15. Take the maximum reading and determine the shim to be used.


B3E0517A196

Differential preload adjust shims (mm {in})

0.50 {0.020}	0.55 {0.022}	0.60 {0.024}
0.65 {0.026}	0.70 {0.028}	0.75 {0.030}
0.80 {0.031}	0.85 {0.033}	0.90 {0.035}
0.95 {0.037}	1.00 {0.039}	1.05 {0.041}
1.10 {0.043}	1.15 {0.045}	1.20 {0.047}
1.25 {0.049}	1.30 {0.051}	1.35 {0.053}
1.40 {0.055}	1.45 {0.057}	1.50 {0.059}
1.55 {0.061}	–	–

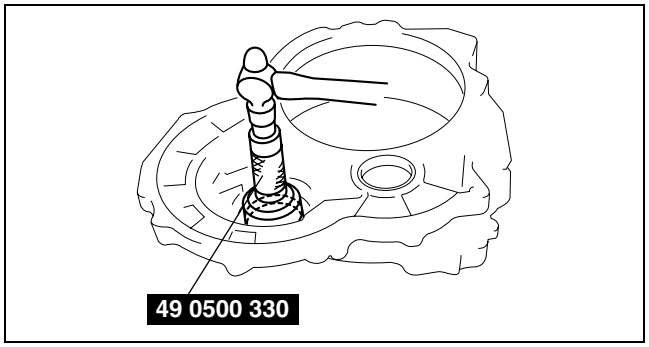
16. Remove the converter housing and **SST** (selector).

17. Install the required adjustment shim and tap the bearing race into the converter housing.
18. Install the converter housing.

    Tightening torque
    19—25 N·m {1.9—2.6 kgf·m, 14—18 ft·lbf}

19. Install the **SST** to the pinion shaft through the converter housing.

    Note
    - Measure several times and calculate the average value.



B3E0517A197

20. Verify that the preload is within the specification. If not, return to Step 1.

    Differential bearing Preload
    Preload: 1.4—2.3 N·m {14—24 kgf·cm, 12—20 in·lbf}
    Reading on pull scale: 14—23 N {1.4—2.4 kgf, 3.1—5.3 lbf}

21. Remove the converter housing.

AUTOMATIC TRANSAXLE ASSEMBLY

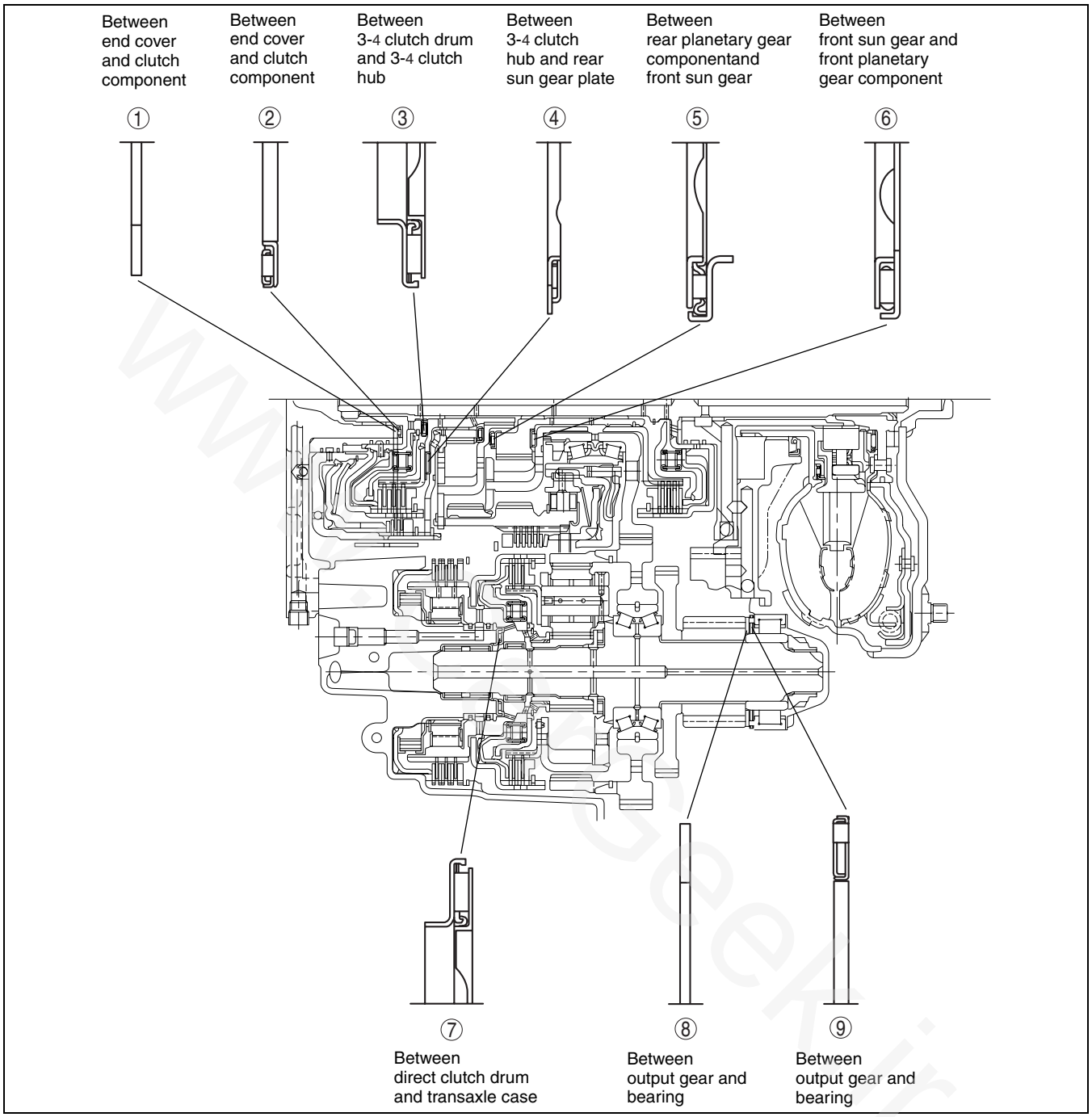
E6U051700000A11

Precaution
General notes

1. Select the adjustment shims, referring to **Bearing Preload**.
2. If the drive plates or 2-4 brake band are replaced with new ones, soak the new part in ATF for at least two hours before installation.
3. Before assembly, apply ATF to all seal rings, rotating parts, O-rings, and sliding parts.
4. All O-rings, seals, and gaskets must be replaced with the new ones included in the overhaul kit.
5. Use petroleum jelly, not grease, when assembling again.
6. When it is necessary to replace a bushing, replace the subassembly that includes that bushing.
7. Assemble the housing within 10 minutes after applying sealant, and allow it to cure for at least 30 minutes after assembly before filling the transaxle with ATF.

Warning
- **Although the stand has a self-locking brake system, there is a possibility that the brake may not hold when the transaxle is held in a lopsided position on the stand. This would cause the transaxle to turn suddenly, causing serious injury. Never keep the transaxle tilted to one side. Always hold the rotating handle firmly when turning the transaxle.**

Assembly
Bearing and race locations



D6E517ZA5080

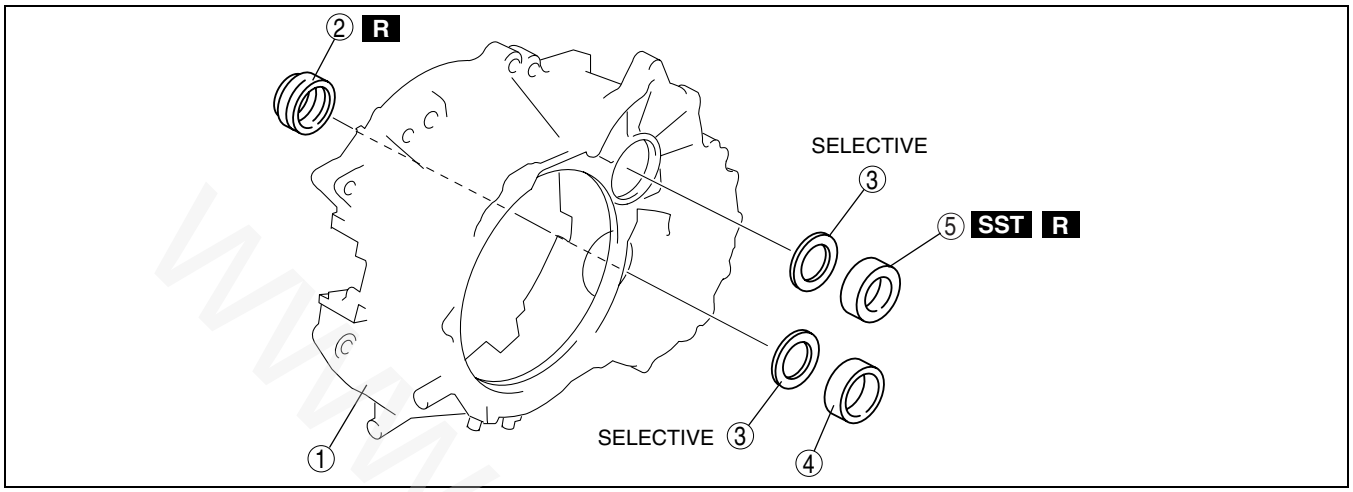
Note

- The bearing and race at locations 3, 4, 5, 6 and 7 are one-piece units.

Outer diameter of bearing and race

	1	2	3	4	5	6	7	8	9
Bearing (mm {in})	—	40.0 {1.57}	39.0 {1.54}	78.2 {3.08}	52.0 {2.05}	50.0 {1.97}	46.5 {1.83}	—	61.0 {2.40}
Race (mm {in})	40.2 {1.58}	—	—	—	—	—	—	59.0 {2.32}	—

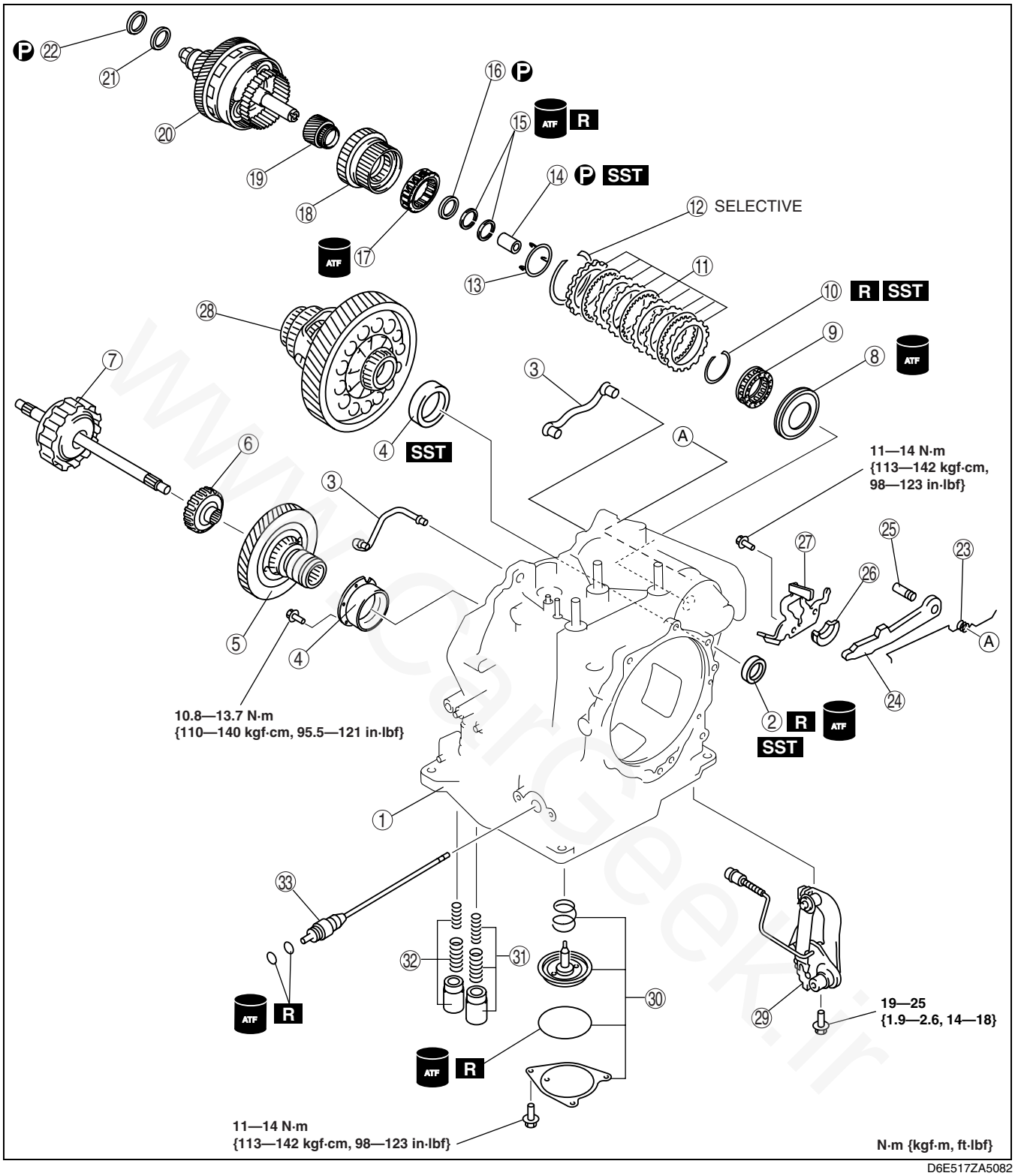
Components



D6E517ZA5081

1	Converter housing
2	Oil seal
3	Adjustment shim

4	Bearing race
5	Bearing



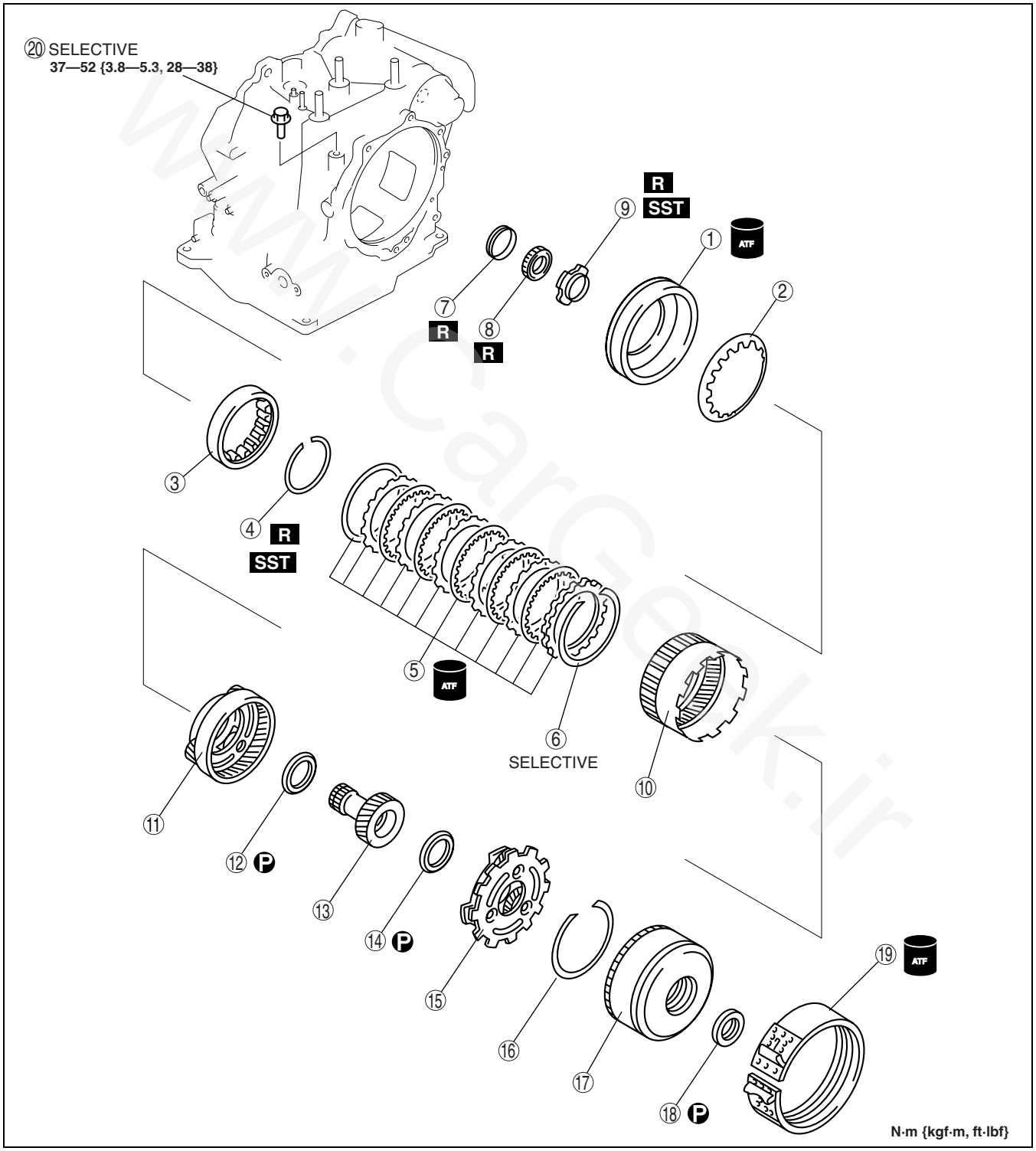
D6E517ZA5082

1	Transaxle case
2	Oil seal
3	Oil pipe
4	Bearing race
5	Primary gear
6	Forward clutch hub
7	Forward clutch
8	Reduction brake piston

9	Springs and retainer component
10	Snap ring
11	Reduction brake
12	Snap ring
13	Spacer
14	Needle bearing
15	Seal rings
16	Needle bearing

17	One-way clutch No.2
18	Direct clutch component
19	Secondary sun gear
20	Output gear component
21	Bearing race
22	Needle bearing
23	Pawl return spring
24	Parking pawl

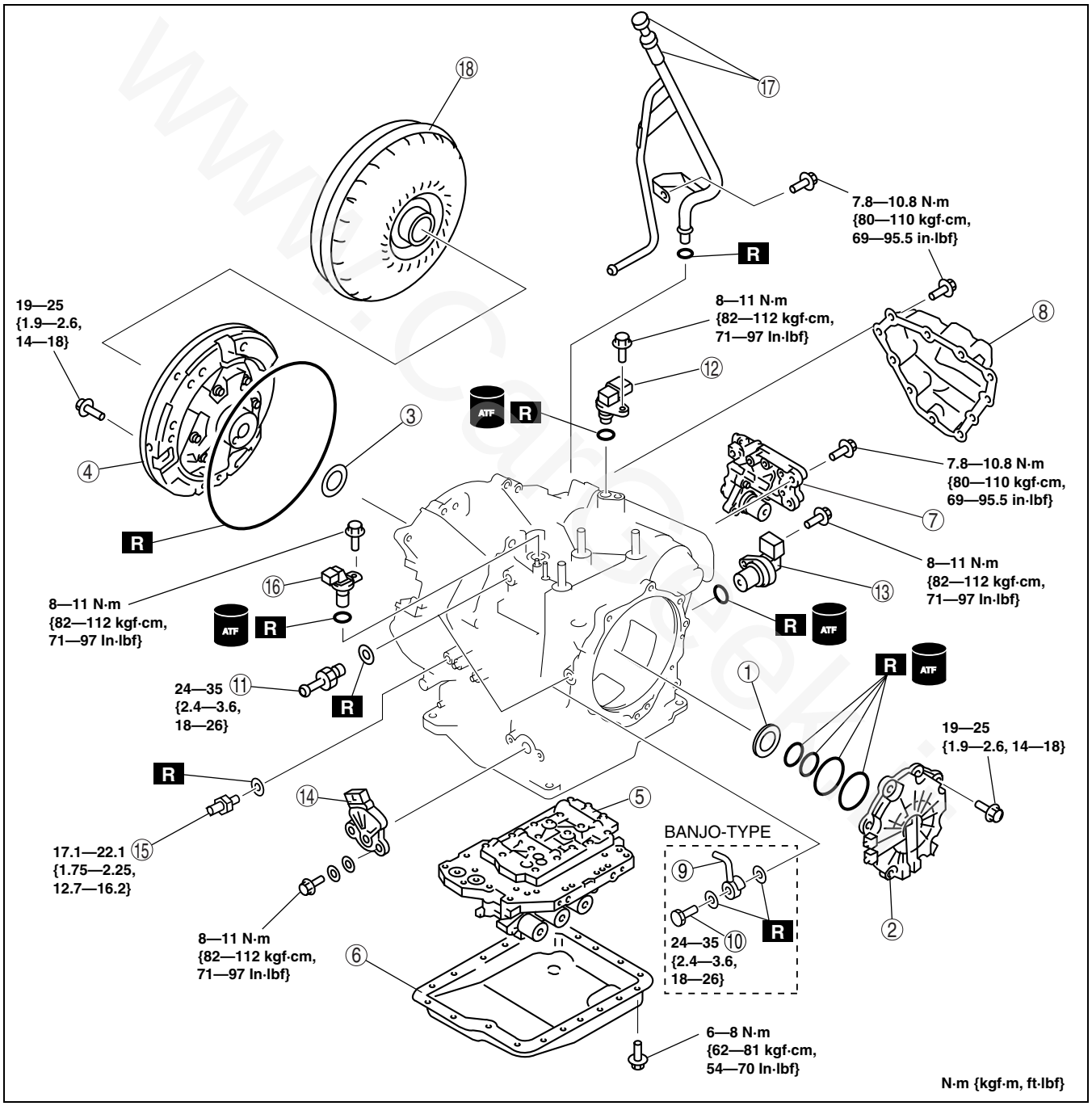
25	Parking pawl shaft
26	Support actuator
27	Actuator plate
28	Differential
29	Parking rod lever component
30	Band servo
31	Forward accumulator
32	Servo apply accumulator
33	Manual shaft



D6E517ZA5083

1	Low and reverse brake piston
2	Low and reverse brake return spring
3	One-way clutch inner race
4	Snap ring
5	Low and reverse brake
6	Snap ring
7	Distance piece
8	Bearing
9	Lock nut
10	Front internal gear and one-way clutch No.1

11	Front planetary gear component
12	Needle bearing
13	Front sun gear
14	Needle bearing
15	Rear planetary gear component
16	Snap ring
17	Clutch component
18	Needle bearing
19	2–4 brake band
20	Band strut



E6U517ZA6002

1	Bearing race
2	End cover

3	Thrust washer
4	Oil pump

5	Primary control valve body component
6	Oil pan
7	Secondary control valve body component
8	Oil cover
9	Oil pipe
10	Connector bolt
11	Connector pipe

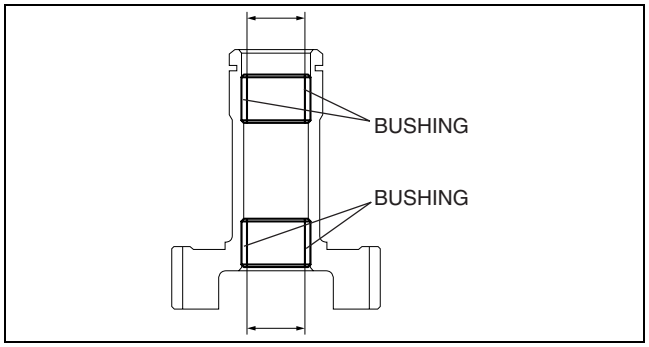
12	Intermediate sensor
13	Vehicle speed sensor
14	Transaxle range switch
15	Oil pressure switch
16	Input/turbine speed sensor
17	Oil dipstick and oil filler tube
18	Torque converter

Assembly procedure

1. Measure the bushing of the front sun gear.

   Front sun gear bushing inner diameter
   Standard: 18.000—18.018 mm {0.70866—0.70936 in}
   Maximum: 18.038 mm {0.71016 in}

2. If not as specified, replace the front sun gear.

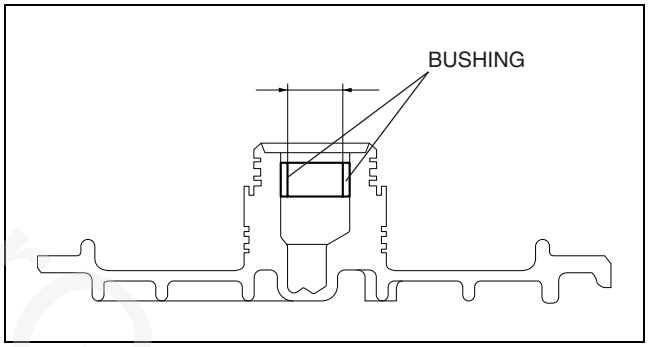


B3E0517A284

3. Measure the bushing of the end cover.

   End cover bushing inner diameter
   Standard: 23.600—23.621 mm {0.92913—0.92995 in}
   Maximum: 23.641 mm {0.93075 in}

4. If not as specified, replace the end cover.

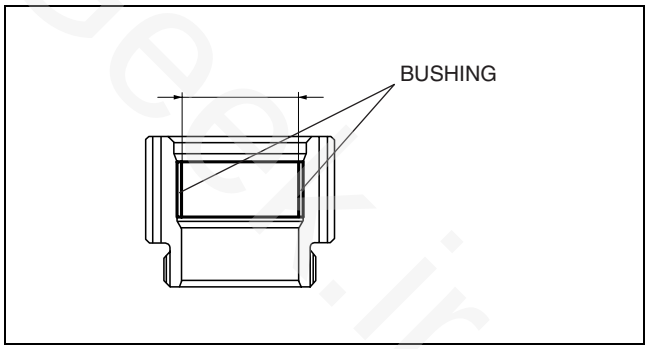


B3E0517A332

5. Measure the bushing of the secondary sun gear.

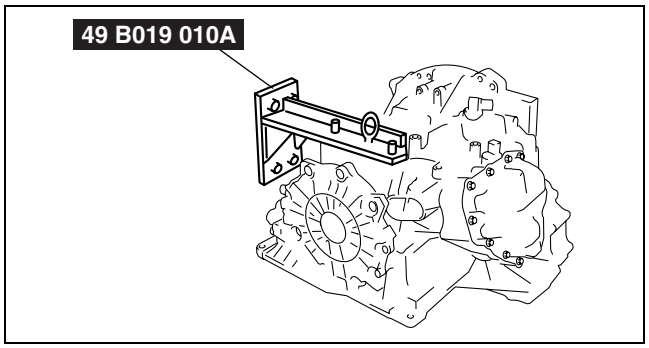
   Secondary sun gear bushing inner diameter
   Standard: 26.000—26.021 mm {1.02362—1.02445 in}
   Maximum: 26.041 mm {1.02524 in}

6. If not as specified, replace the secondary sun gear.



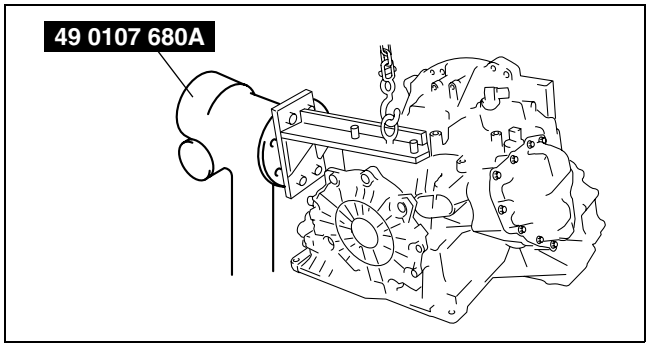
D6E517ZA5085

7. Assemble the **SST**.



D6J517ZA4130

8. Lift the transaxle case and mount it on the **SST**.



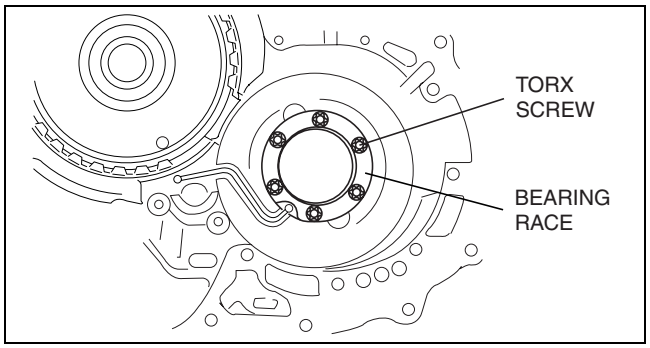
D6J517ZA4131

Note
- If the transaxle case has been newly replaced perform step (9).

9. Install the oil pipe.

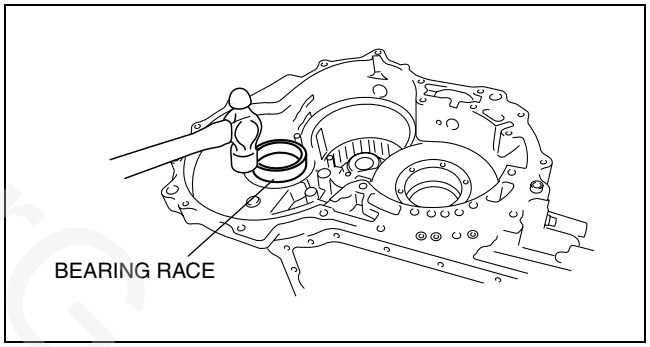
10. Install the bearing race, then tighten torx screws.

Tightening torque
10.8—13.7 N·m
{110—140 kgf·cm, 95.5—121 in·lbf}



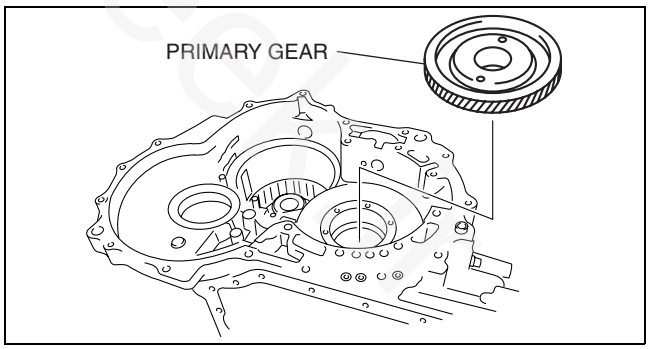
D6E517ZA5086

11. Install the bearing race to the transaxle case.



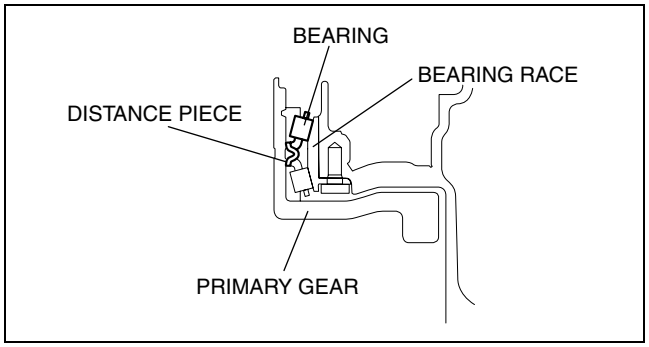
D6E517ZA5087

12. Install the locknut.
(1) Set the primary gear.



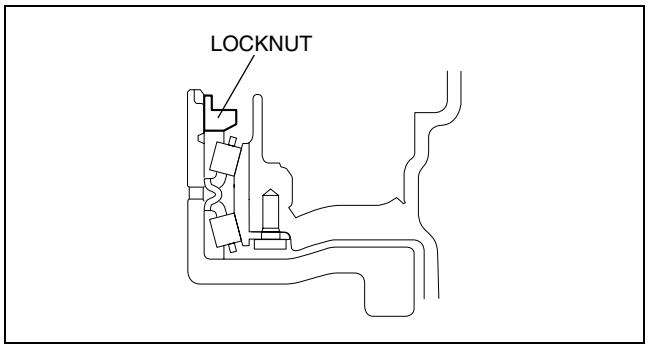
D6E517ZA5088

(2) Set the distance piece and bearing.



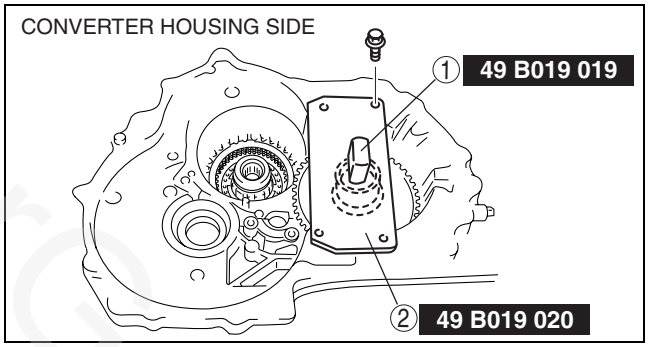
B3E0517A289

(3) Loosely tighten the locknut.

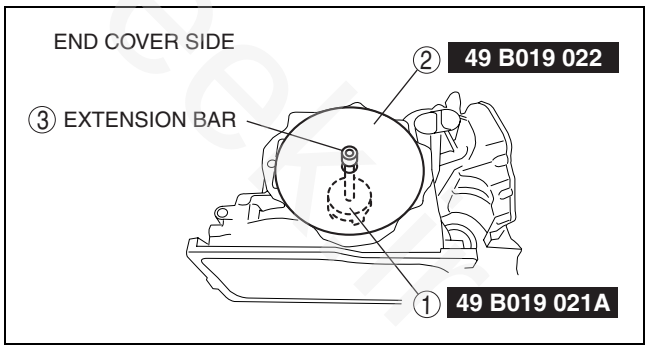


B3E0517A290

(4) Set the **SSTs** in the order shown.



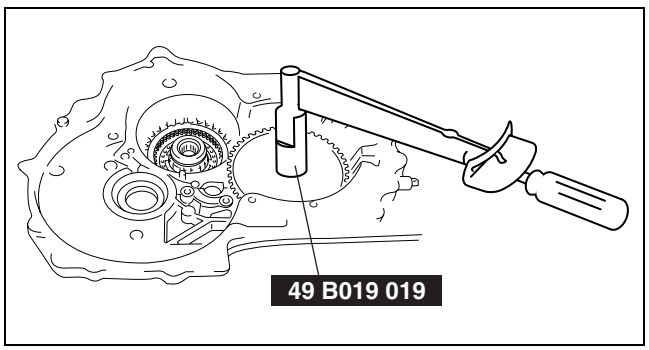
D6E517ZA5026



D6E517ZA5027

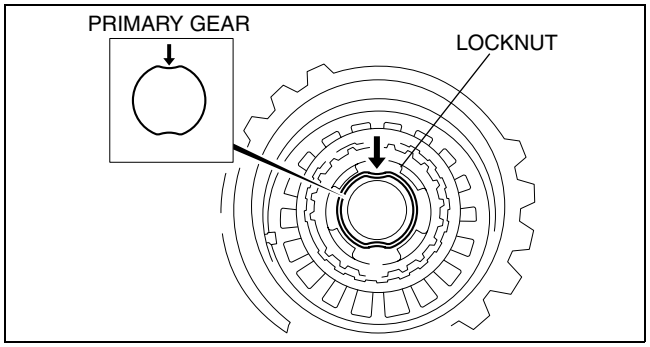
(5) Tighten the locknut from the end cover side to adjust the preload within the specification.

Primary gear preload
0.50—0.90 N·m {5.10—9.17 kgf·cm, 4.42—7.96 in·lbf}



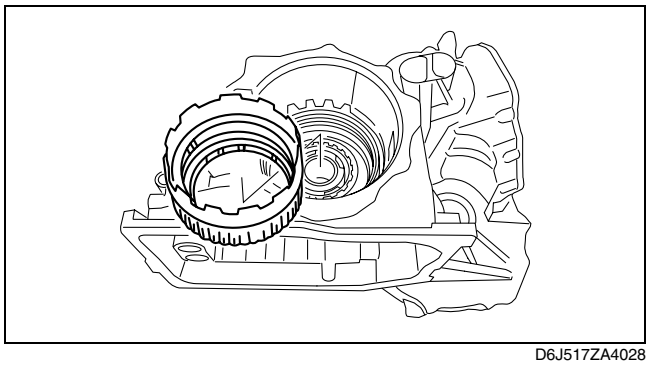
D6J517ZA4077

(6) Stake the locknut.
(7) Remove the **SST**



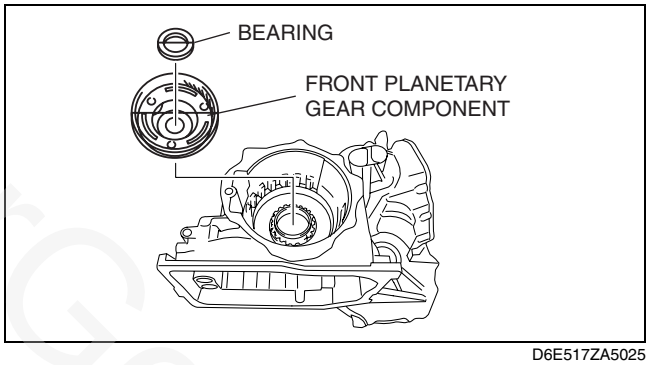
B3E0517A292

13. Install the front internal gear and one-way clutch.
14. Apply petroleum jelly to the bearing, and secure it to the front planetary gear component.



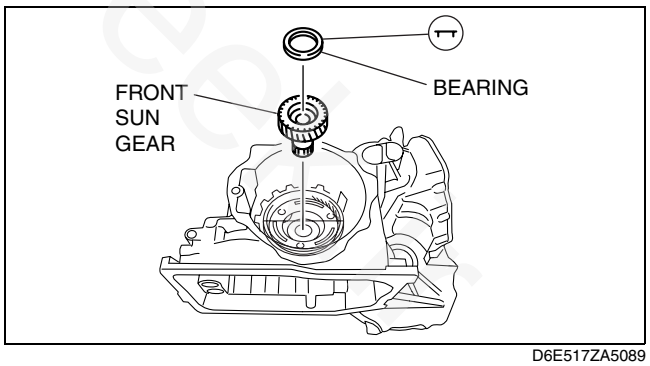
D6J517ZA4028

15. Install the front planetary gear component.
16. Apply petroleum jelly to the bearing, and secure it to the front sun gear.



D6E517ZA5025

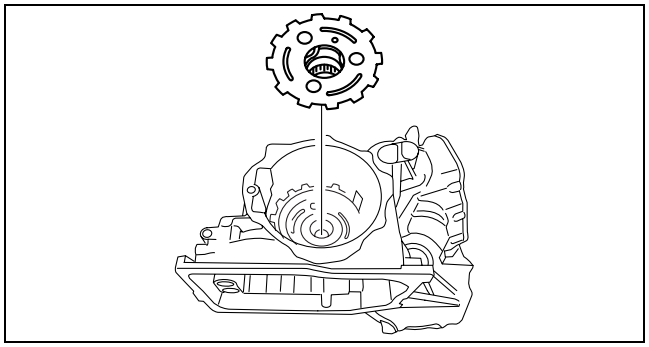
17. Install the front sun gear.



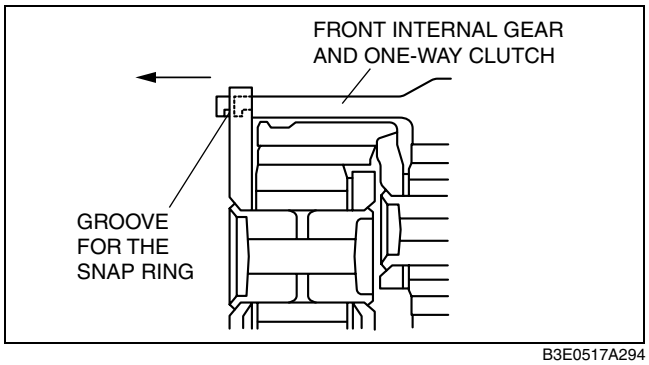
D6E517ZA5089

18. Install the rear planetary gear.

Note
- Rotate the engine stand so that the oil pan faces downward. Pull the front internal gear and one-way clutch component a little until the groove for the snap ring appears, then install the snap ring.

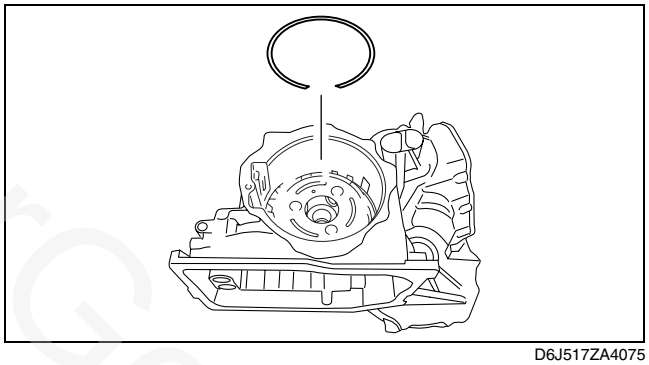


D6J517ZA4025



B3E0517A294

19. Install the snap ring.
20. Rotate the engine stand so that the end cover faces upward, and verify that the snap ring is installed accurately.

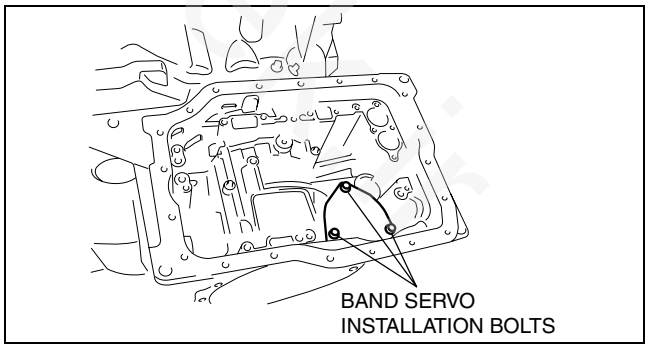


D6J517ZA4075

21. Install the band servo component.
    (1) Install the servo return spring and servo piston.
    (2) Apply ATF to the O-ring, and install it to the transaxle case.
    (3) Install the servo retainer.

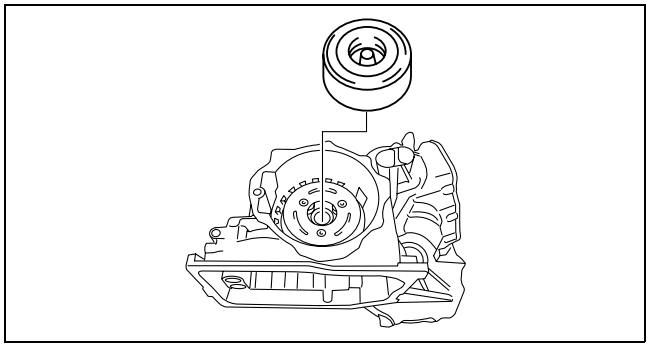
Tightening torque
11—14 N·m {113—142 kgf·cm, 98—123 in·lbf}

22. Apply petroleum jelly to the bearing, and secure it to the clutch component.



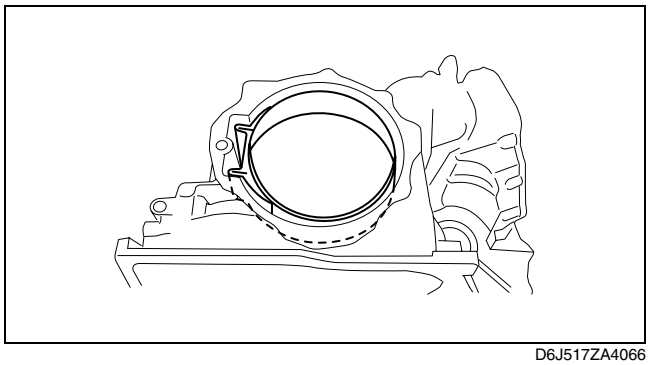
D6E517ZA5014

23. Install the clutch component.



D6J517ZA4023

24. Install the 2-4 brake band.

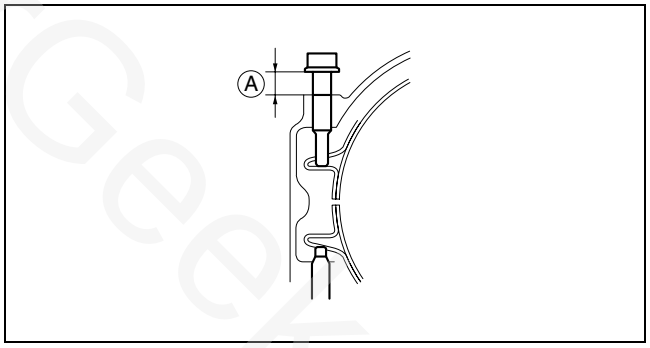


D6J517ZA4066

25. Select the band strut.
    (1) Find an appropriate bolt (under head length: **60—70 mm {2.36—2.75 in}**), and tighten the 2-4 brake band with the bolt.

    Tightening torque
    4.9 N·m {50 kgf·cm, 43 in·lbf}

    (2) Measure the dimension A shown in the figure.
    (3) Remove the bolt.

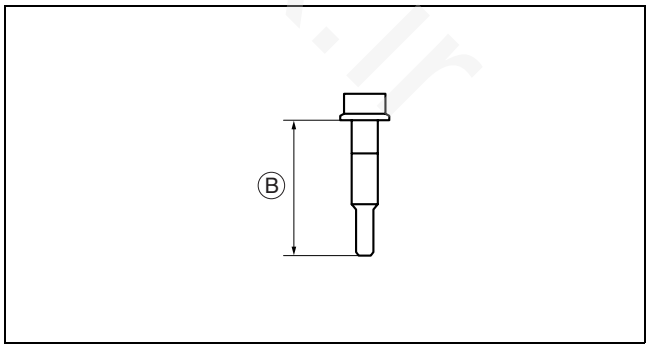


B3E0517A297

    (4) Measure the dimension B shown in the figure.
    (5) Calculate according to the formula below.

    B – A = C (The middle of the under head length)
    C – 4 = D (The lower limit of under head length)
    C – 4.7 = E (The upper limit of under head length)

    (6) Select a band strut whose length should be between D and E.



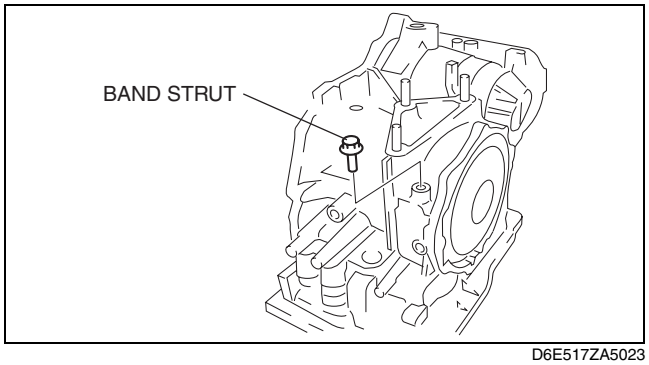
B3E0517A298

Band strut length for 2-4 brake band servo stroke (mm {in})

36.0 {1.417}	36.5 {1.437}	37.0 {1.457}
37.25 {1.467}	37.5 {1.476}	37.75 {1.486}
38.0 {1.496}	38.25 {1.506}	38.5 {1.516}
39.0 {1.535}	–	–

(7) Install the selected band strut.

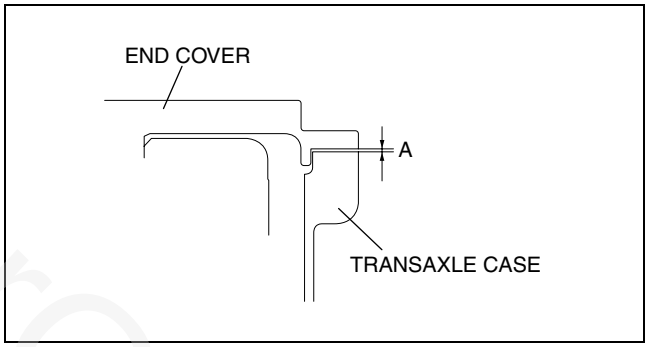
Tightening torque
37—52 N·m {3.8—5.3 kgf·m, 28—38 ft·lbf}



D6E517ZA5023

26. Use the following procedure to adjust the total end play.
(1) Install the thickest bearing race (**2.6 mm {0.102 in}**) to the end cover.
(2) Install the end cover to the clutch component.
(3) Measure the clearance A between transaxle case and end cover.
(4) Calculate according to the formulas below. Select an appropriate bearing race whose bearing thickness matches the calculated limits.

A – 2.6 mm {0.102} (Bearing thickness) = B
B – 0.25 = C (The lower limit of bearing thickness)
B – 0.50 = D (The upper limit of bearing thickness)



B3E0517A299

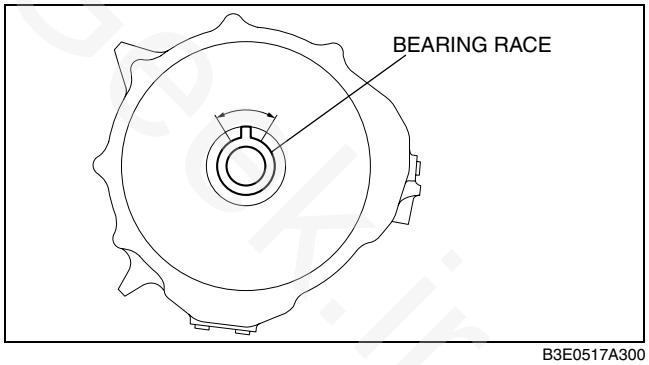
(5) Select a bearing race whose thickness is between D mm {in} and C mm {in}.

Bearing race sizes

mm {in}

1.8 {0.071}	2.0 {0.079}	2.2 {0.087}
2.4 {0.094}	2.6 {0.102}	–

Caution
- **The bearing race and end cover may be damaged if the end cover is not installed correctly to the transaxle case. Align the projection of the bearing race within the area of the arrows shown in the figure, and then install the end cover to the transaxle case.**

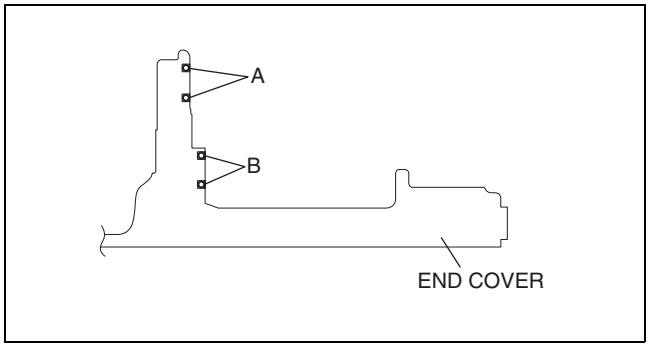


B3E0517A300

(6) Remove the end cover, apply petroleum jelly to the selected bearing race, then install it to the end cover.

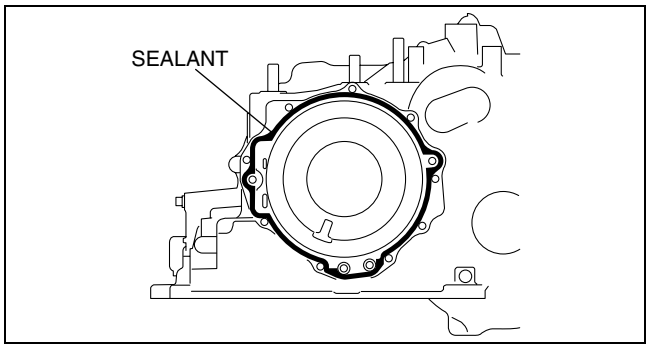
27. Apply ATF to new seal ring, and install it to the end cover.

    Seal ring inner diameter
    A: 47.1 mm {1.854 in}
    B: 55.8 mm {2.197 in}



B3E0517A301

28. Apply a light coat of silicone sealant to the contact surfaces of the transaxle case and the end cover.
29. Apply ATF to the O-ring and install it to the transaxle case.



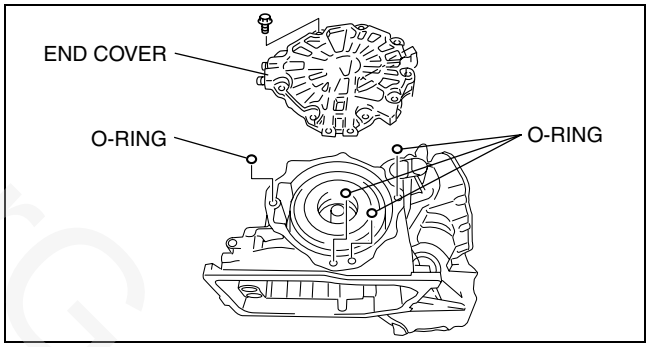
D6E517ZA5091

30. Install the end cover to the transaxle case.

    Tightening torque
    19—25 N·m {1.9—2.6 kgf·m, 14—18 ft·lbf}

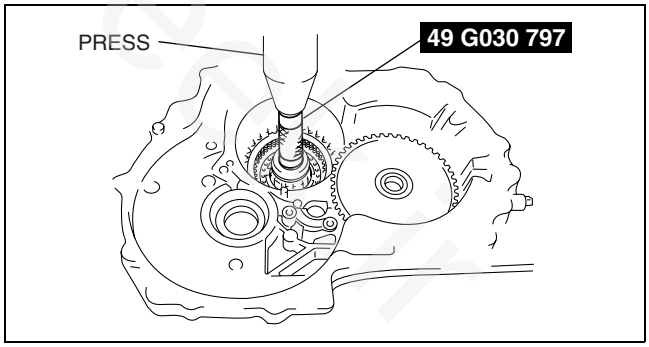
31. Install the reduction brake to the transaxle case. (See 05–17–46 REDUCTION BRAKE DISASSEMBLY/ASSEMBLY.)

    Note
    - If the transaxle case has been newly replaced perform Step (32).



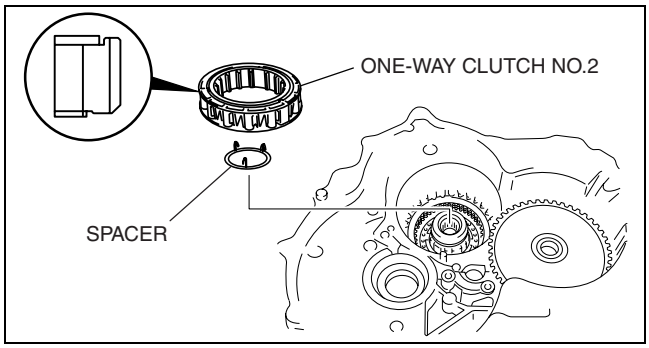
D6E517ZA5022

32. Install the needle bearing using the **SST** as shown in the figure.



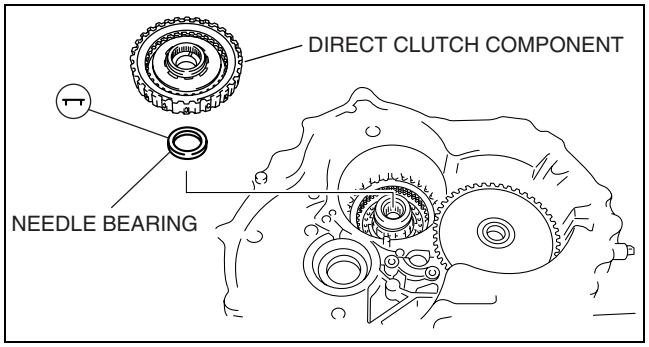
D6E517ZA5092

33. Install the spacer and one-way clutch No.2 to the transaxle case.
34. Apply ATF to new seal ring, and install it to the transaxle case.
35. Apply petroleum jelly to the needle bearing, and secure it to the transaxle case.



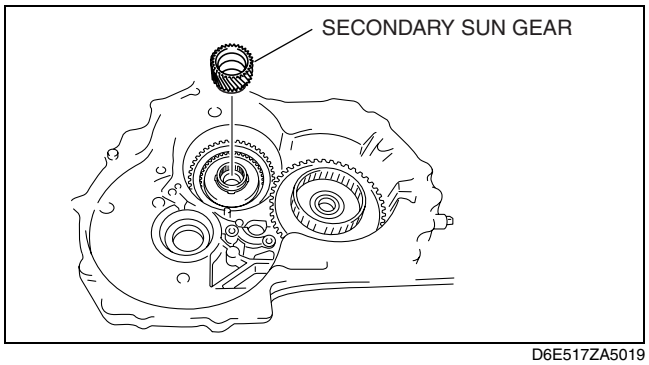
D6E517ZA5093

36. Install the direct clutch component to the transaxle case.



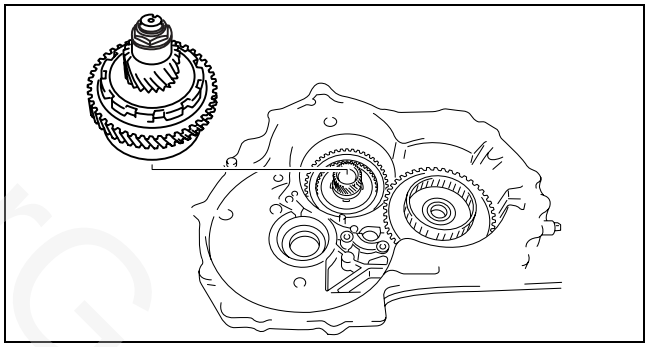
D6E517ZA5094

37. Install the secondary sun gear.



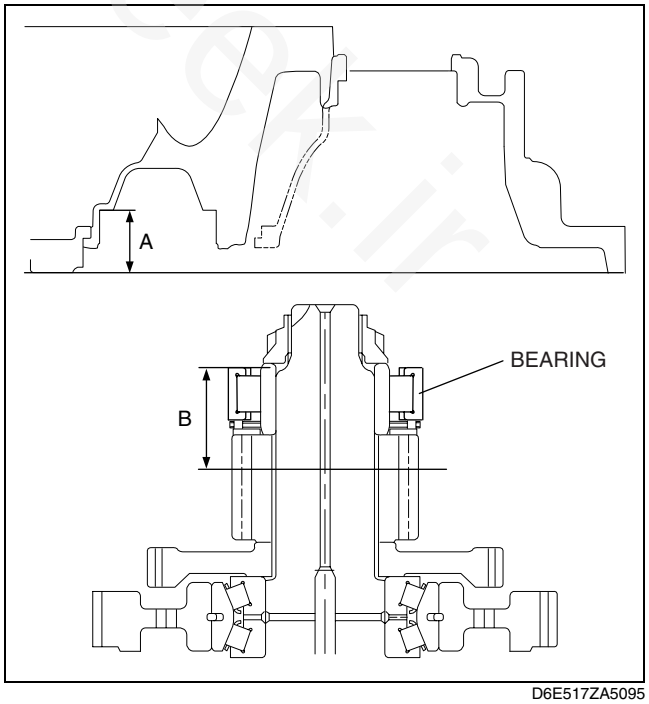
D6E517ZA5019

38. Install the output gear component.
39. Install the bearing race to the output gear component.
40. Apply petroleum jelly to the needle bearing, and secure it to the output gear component.



D6J517ZA4039

41. Use the following procedure to adjust the total end play.
    (1) Measure clearance A between the installation surface and the hole depth of the converter housing.
    (2) Install the bearing to the output gear component.
    (3) Measure clearance B between the converter housing installation surface and the bearing.
    (4) Calculate the total end play according to the following formula:
    step (1) value – step (3) value = total end play.
    (5) select the snap ring.



D6E517ZA5095

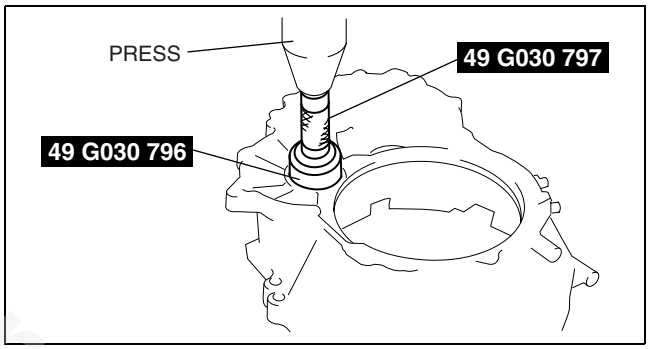
Adjust shim size for output gear component total end play

total end play {in}	Adjust shims sizes mm {in}
1.431—1.481 {0.057—0.058}	1.20 {0.047}
1.381—1.431 {0.055—0.056}	1.15 {0.045}
1.331—1.381 {0.053—0.054}	1.10 {0.043}
1.281—1.331 {0.051—0.052}	1.05 {0.041}
1.231—1.281 {0.049—0.050}	1.00 {0.039}
1.181—1.231 {0.047—0.048}	0.95 {0.037}
1.131—1.181 {0.045—0.046}	0.90 {0.035}
1.081—1.131 {0.043—0.044}	0.85 {0.033}
1.031—1.081 {0.041—0.042}	0.80 {0.031}
0.981—1.031 {0.039—0.040}	0.75 {0.029}
0.931—0.981 {0.037—0.038}	0.70 {0.028}
0.881—0.931 {0.035—0.036}	0.65 {0.026}
0.831—0.881 {0.033—0.034}	0.60 {0.024}
0.781—0.831 {0.031—0.032}	0.55 {0.022}
0.731—0.781 {0.029—0.030}	0.50 {0.020}

(6) Install the selected adjustment shim to the converter housing.

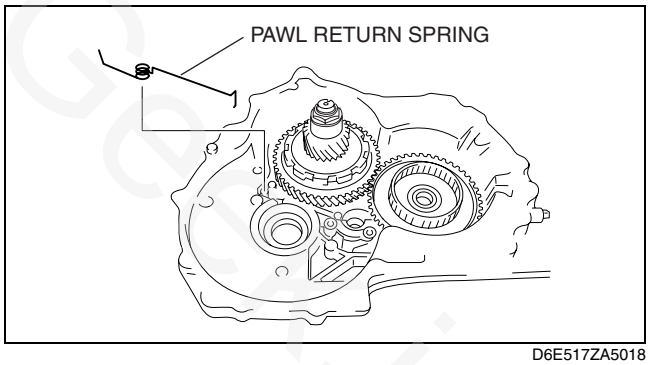
42. Install the bearing using the **SST** as shown in the figure.

Press-in force
8.8 kN {897 kgf, 1978 lbf}



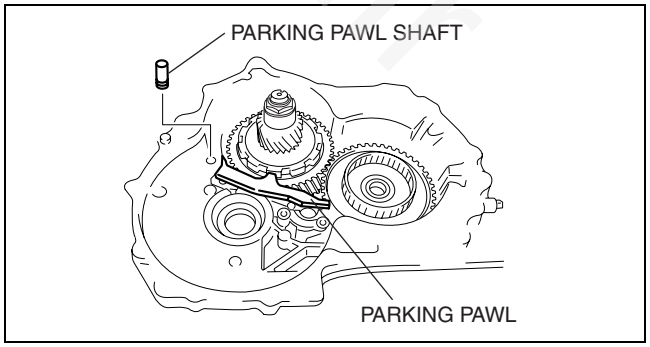
D6E517ZA5096

43. Install the pawl return spring to the transaxle case.



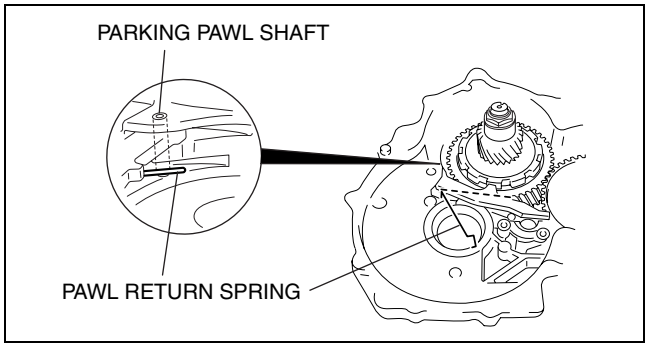
D6E517ZA5018

44. Install the packing pawl and parking pawl shaft to the transaxle case.



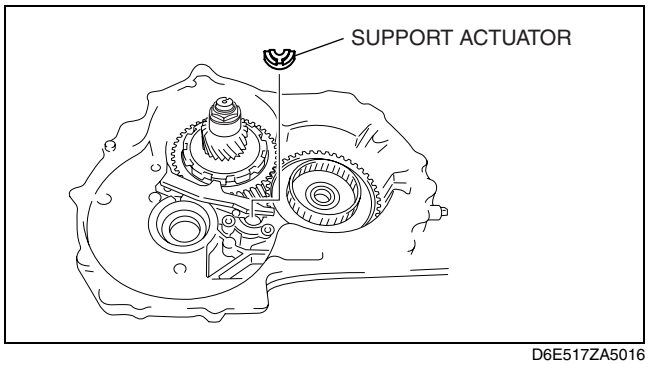
D6E517ZA5017

45. Install the pawl return spring to the parking pawl and parking pawl shaft.



D6E517ZA5097

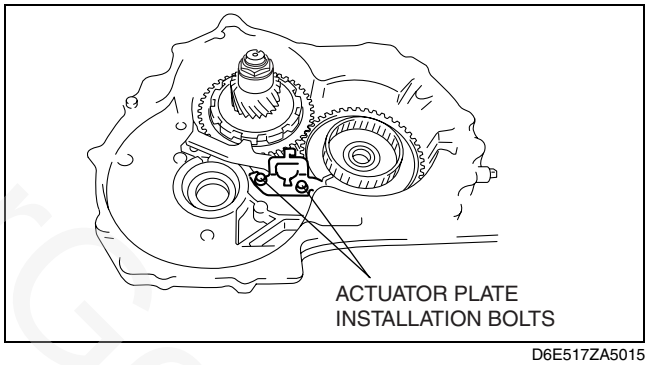
46. Install the support plate to the transaxle case.



D6E517ZA5016

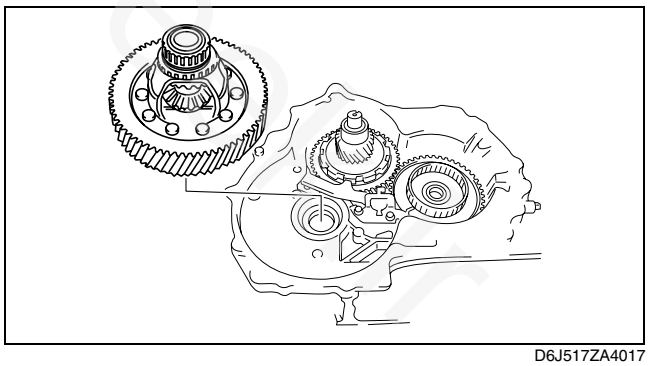
47. Install the actuator plate to the transaxle case.

Tightening torque
11—14 N·m
{113—142 kgf·cm, 98—123 in·lbf}



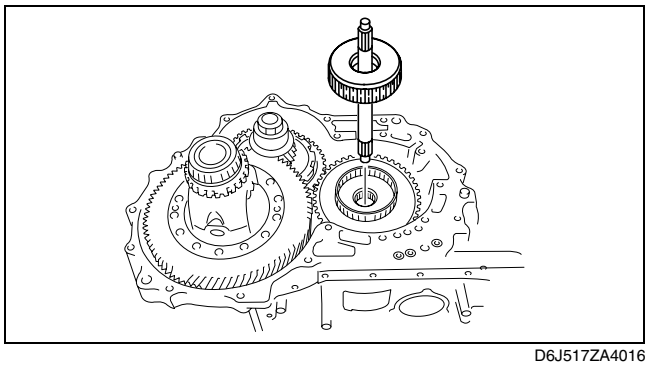
D6E517ZA5015

48. Install the differential.
49. Install the forward clutch hub.



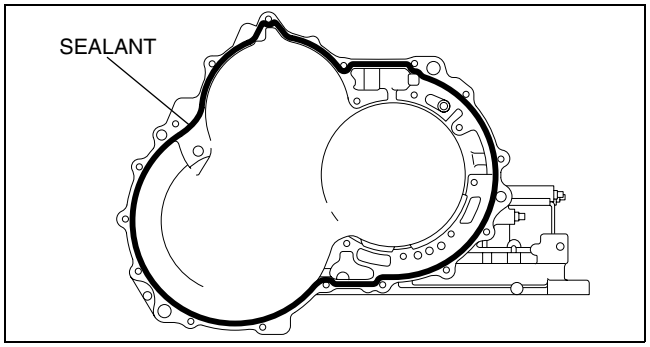
D6J517ZA4017

50. Install the forward clutch component.



D6J517ZA4016

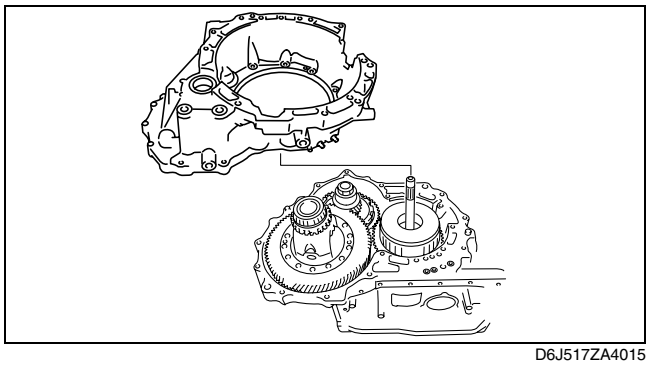
51. Apply a light coat of silicone sealant to the contact surfaces of the converter housing and the transaxle case.



B3E0517A305

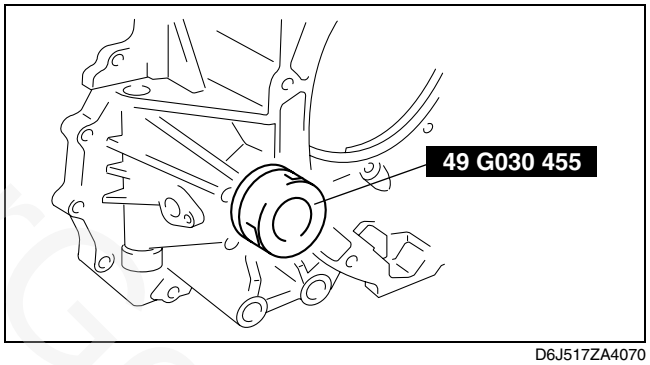
52. Install the converter housing.

Tightening torque
19—25 N·m
{1.9—2.6 kgf·m, 14—18 ft·lbf}



D6J517ZA4015

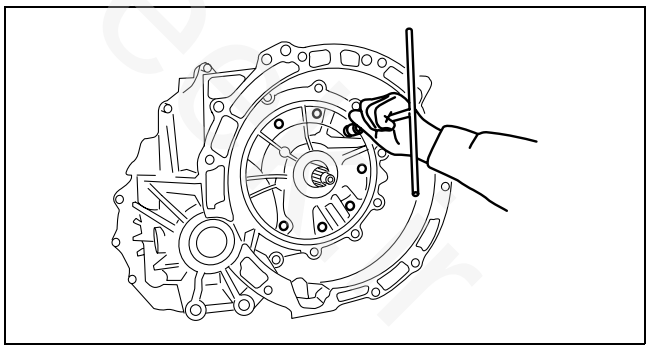
53. Install the **SST** into the differential side gears.
54. Apply ATF to the new O-ring and install it to the oil pump.



D6J517ZA4070

55. Install the oil pump.

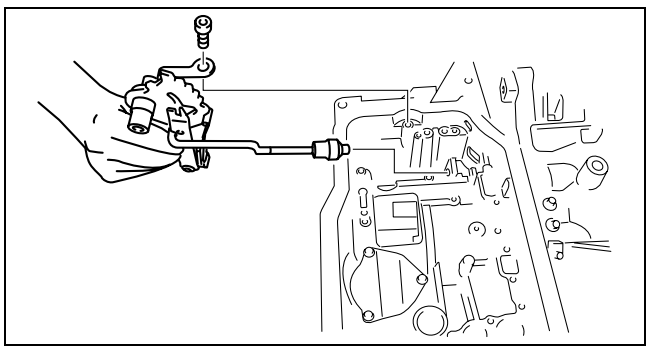
Tightening torque
19—25 N·m
{1.9—2.6 kgf·m, 14—18 ft·lbf}



D6J517ZA4014

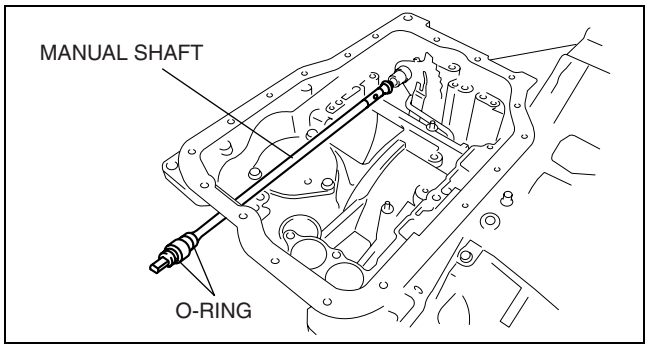
56. Install the parking rod lever component.

Tightening torque
19—25 N·m
{1.9—2.6 kgf·m, 14—18 ft·lbf}



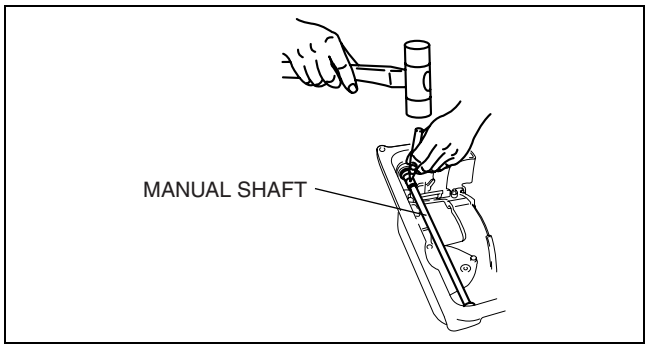
D6J517ZA4012

57. Apply ATF to the new O-ring and install it to the manual shaft.
58. Install the manual shaft.
    (1) Install the manual shaft to the manual plate and detent bracket component.



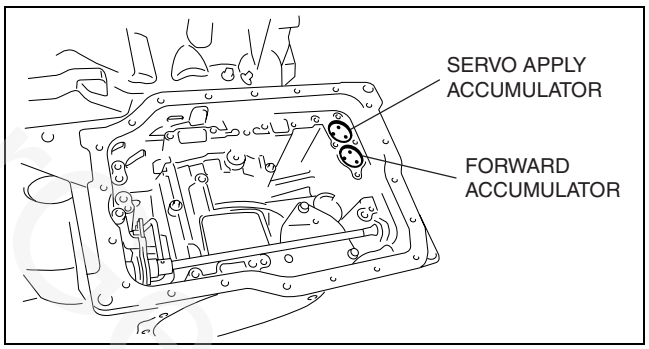
D6E517ZA5013

    (2) Install the knock pin.



D6E517ZA5012

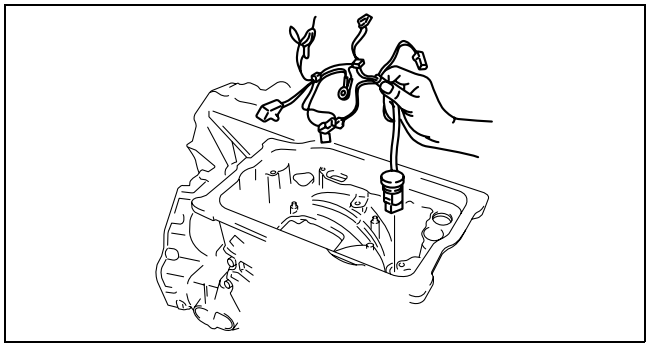
59. Install the accumulator component.



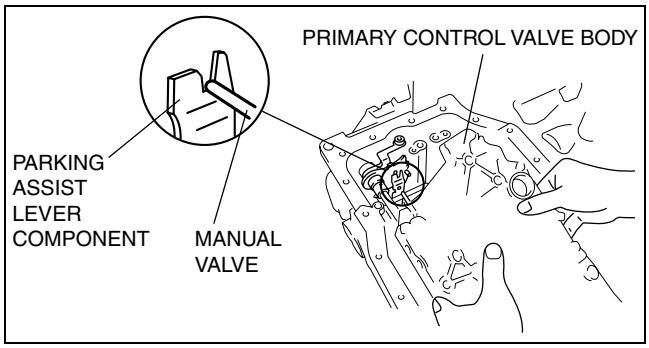
D6E517ZA5011

60. Install the coupler component.

Caution
- **Make sure that the head of the manual valve and the parking rod are assembled properly. If they are not, the ranges cannot be changed.**



D6J517ZA4008

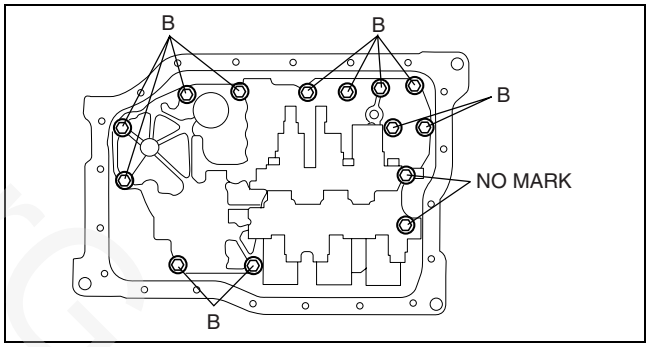


D6E517ZA5002

61. Install the primary control valve body.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}

Bolt length (measured from below the head)
B: 40 mm {1.575 in}
No mark: 70 mm {2.756 in}

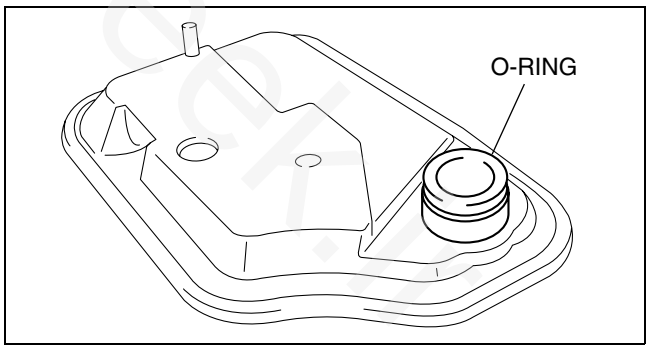


D6E517ZA5098

62. Apply ATF to the new O-ring and install it to the oil strainer.

63. Install the oil strainer.
64. Match the harness colors, then connect the solenoid connector and TFT sensor.

Solenoid valve	Color of connector (harness side)
Pressure control solenoid A	Black
Shift solenoid A	White
Shift solenoid B	Blue
Shift solenoid C	Green
Shift solenoid D	White
Shift solenoid E	Black

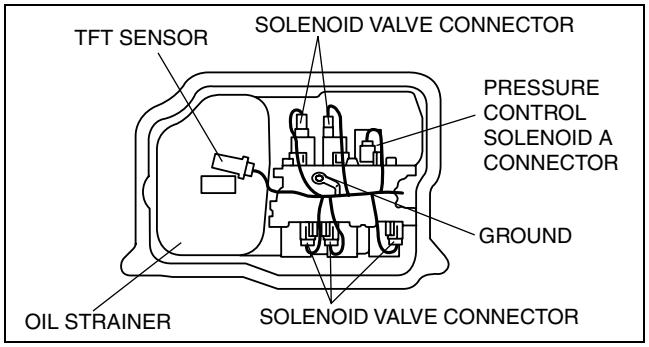


D6E517ZA5099

65. Install the ground.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}

Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

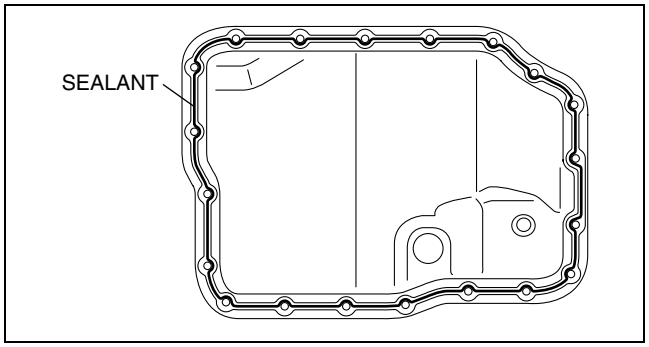


E6U517AW5007

Caution
- **Clean the transaxle exterior thoroughly with a steam cleaner or cleaning solvents before removal.**
- **If any old sealant gets into the transaxle during installation of the oil pan, trouble may occur in the transaxle case and oil pan, and clean with cleaning fluids.**

66. Apply a light coat of silicone sealant to the contact surfaces of oil pan and transaxle case.
67. Install the oil pan.

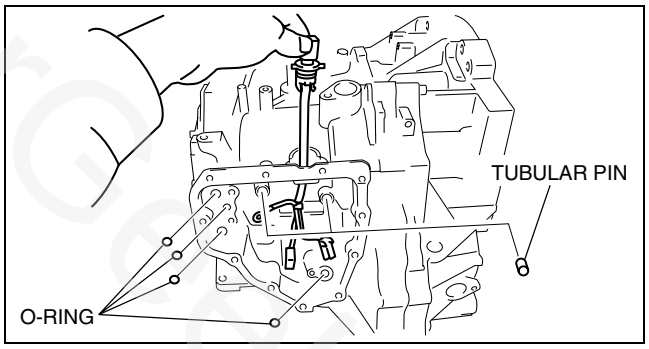
Tightening torque
6—8 N·m
{62—81 kgf·cm, 54—70 in·lbf}



D6E517ZA5100

68. Apply ATF to the new O-ring and install it to the transaxle case.

69. Install the tubular pins.
70. Install the coupler component.

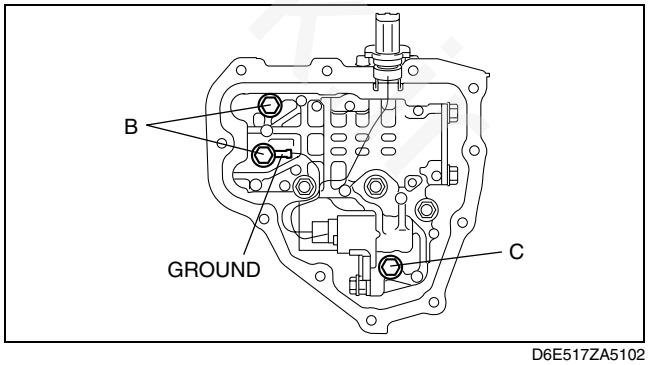


D6E517ZA5009

71. Install the secondary control valve body and ground.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}

Bolt length (measured from below the head)
B: 40 mm {1.575 in}
C: 50 mm {1.969 in}



D6E517ZA5102

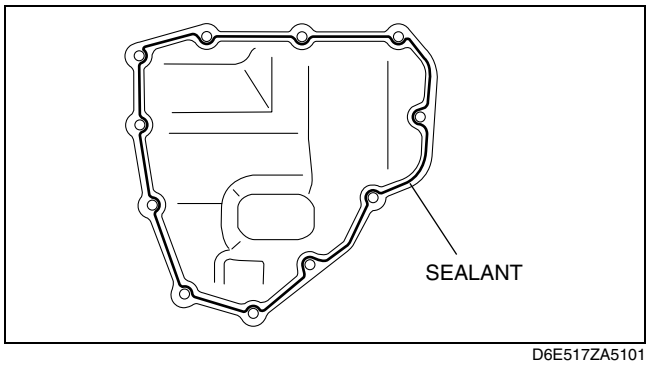
72. Match the harness colors, then connect the solenoid connector.

Solenoid valve	Color of connector (harness side)
Pressure control solenoid B	White
Shift solenoid F	Black

Warning
- **Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.**

Caution
- **Clean the transaxle exterior thoroughly with a steam cleaner or cleaning solvents before removal.**
- **If any old sealant gets into the transaxle during installation of the oil cover, trouble may occur in the transaxle case and oil pan, and clean with cleaning fluids.**

73. Apply a light coat of silicone sealant to the contact surfaces of oil cover and transaxle case.
74. Install the oil cover.



D6E517ZA5101

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}

75. Install the oil pipe and connector bolt.

Tightening torque
24—35 N·m
{2.4—3.6 kgf·cm, 18—26 in·lbf}

76. Install the connector pipe.

Tightening torque
24—35 N·m
{2.4—3.6 kgf·cm, 18—26 in·lbf}

77. Apply ATF to the new O-ring and install it to the intermediate sensor.
78. Install the intermediate sensor.

Tightening torque
8—11 N·m
{82—112 kgf·cm, 71—97 in·lbf}

79. Apply ATF to the new O-ring and install it to the vehicle speed sensor.
80. Install the vehicle speed sensor.

Tightening torque
8—11 N·m
{82—112 kgf·cm, 71—97 in·lbf}

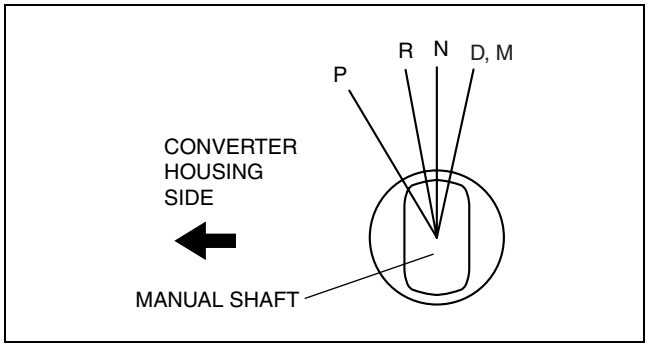
81. Apply ATF to the new O-ring and install it to the input/turbine speed sensor.
82. Install the oil pressure switch.

Tightening torque
17.1—22.1 N·m
{1.75—2.25 kgf·m, 12.7—16.2 ft·lbf}

83. Install the input/turbine speed sensor.

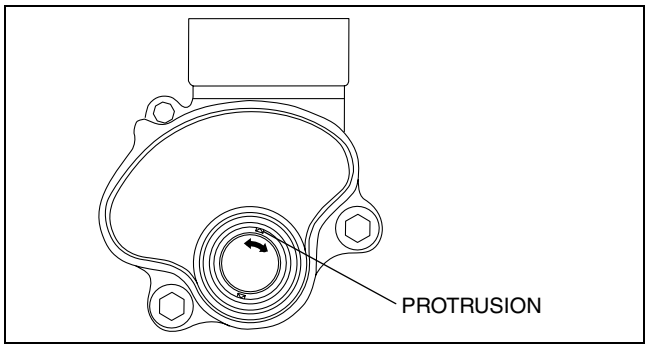
Tightening torque
8—11 N·m
{82—112 kgf·cm, 71—97 in·lbf}

84. Install the transaxle range switch.
    (1) Rotate the manual shaft to the N position.

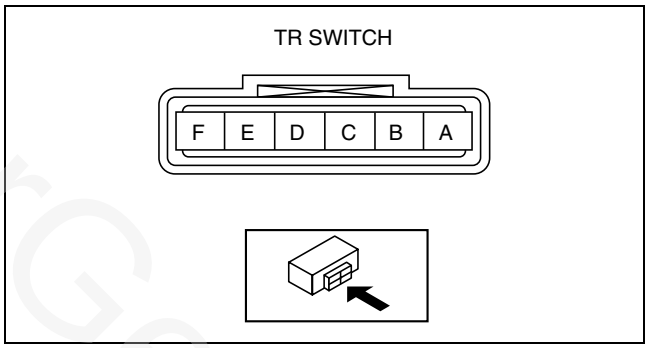


D6E517AW5007

    (2) Turn the protrusion a resistance between the terminals B and C become **750 ohms**.

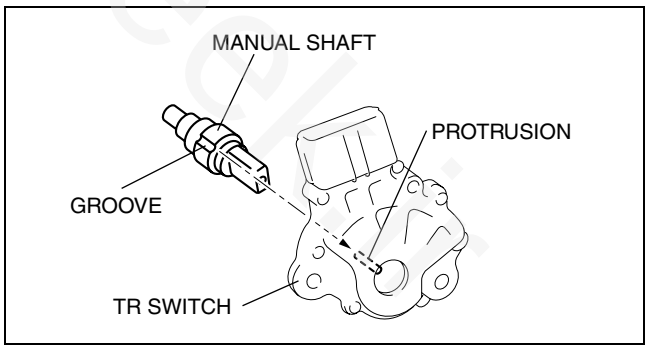


B3E0517A315



B3E0517A316

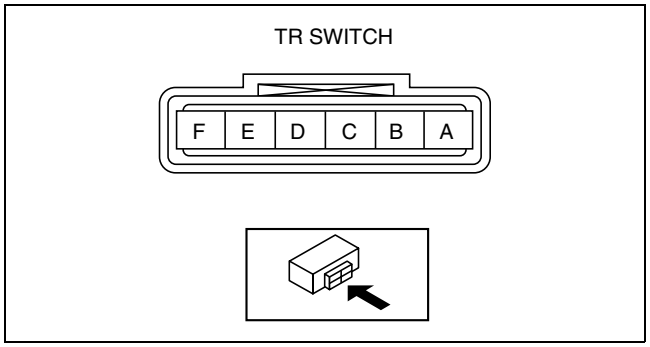
    (3) Install the TR switch while aligning the protrusion and groove as shown.
    (4) hand- tighten the TR switch mounting bolts.



B3E0517A317

(5) Inspect the resistance between the terminals B and C.
- If not as specified, readjust the TR switch.

Resistance
750 ohms



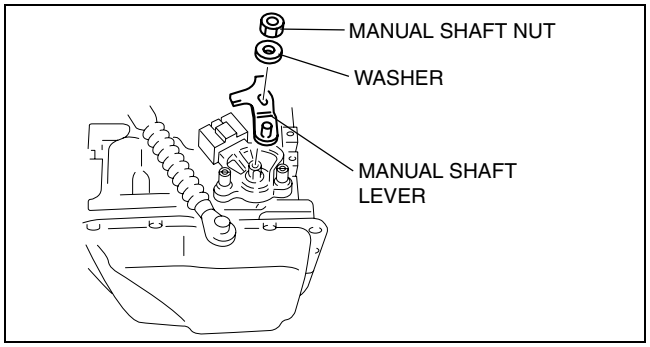
B3E0517A316

(6) Tighten the TR switch mounting bolts

Tightening torque
8—11 N·m
{82—112 kgf·cm, 71—97 in·lbf}

Caution
- **Do not use an impact wrench. Hold the manual shaft lever when removing the manual shaft nut, or the transaxle may be damaged.**

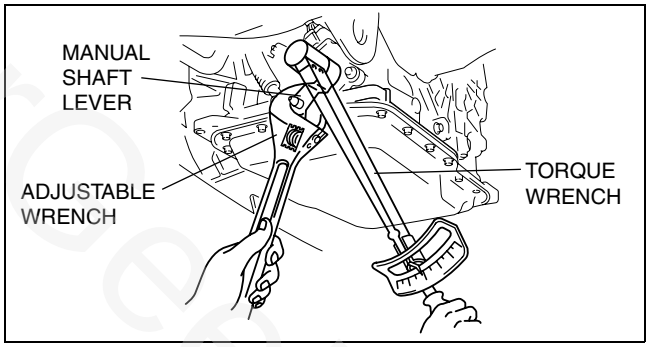
(7) Install the manual shaft lever and the washer.



B3E0517A318

(8) Set the adjustable wrench as shown to hold the manual shaft lever, and tighten the manual shaft nut.

Tightening torque
32—46 N·m
{3.2—4.7 kgf·m, 24—33 ft·lbf}



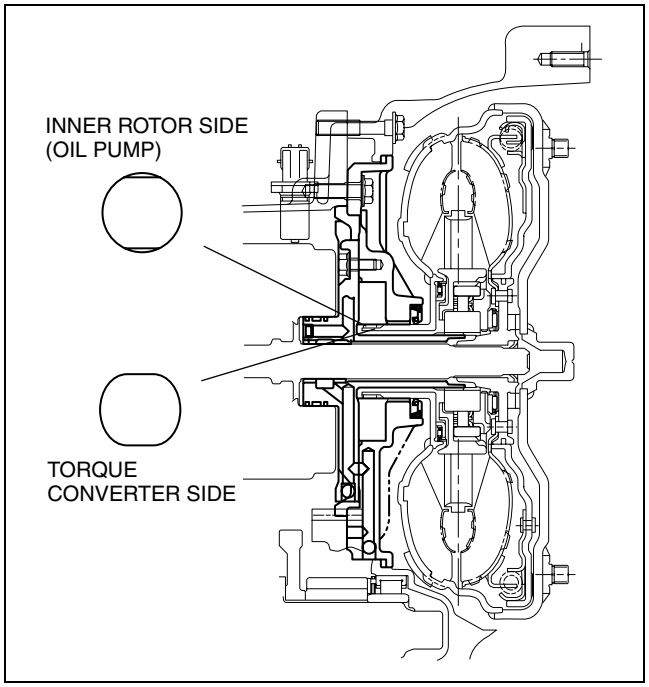
B3E0517A319

85. Remove the transaxle from the **SST**.
86. Apply ATF to the new O-ring and install it to the oil filler tube.
87. Install the oil dipstick and oil filler tube to the transaxle.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}

88. Drain any ATF remaining in the torque converter.
89. Pour in solvent (**approx. 0.5 L {0.53 US qt, 0.44 Imp qt}**),
90. Shake the torque converter to clean the inside.
91. Pour out the solvent.
92. Pour the ATF.

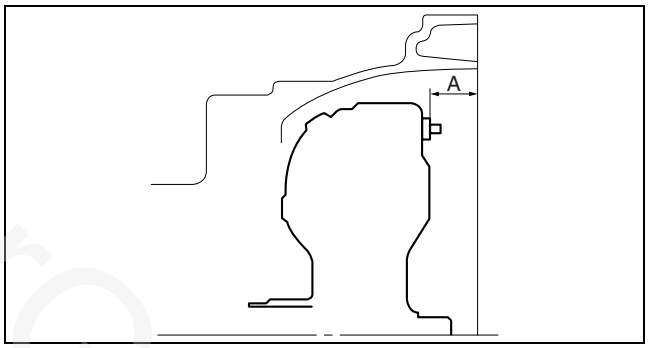
93. Install the torque converter by aligning its gap to the oil pump inner rotor gap as shown in the figure.



D6E517ZA5103

94. To ensure that the torque converter is installed accurately, measure distance A between the end of the torque converter and the end of the converter housing.

    Between the end of the torque converter and the end of the converter housing
    Distance A: 21.4 mm {0.84 in}



B3E0517A321

AUTOMATIC TRANSAXLE INSPECTION

E6U051700000A12

Torque Converter Inspection

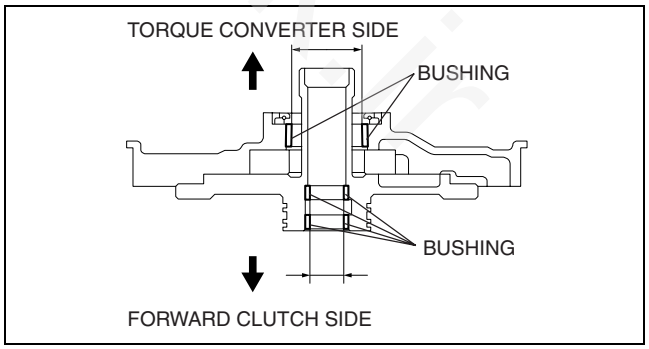
1. Inspect the outer surface of the torque converter for damage or cracks, and replace it if necessary.
2. Inspect for rust on the pilot hub of the torque converter or on the boss. If there is any, remove the rust completely.

Oil Pump Preinspection

1. Measure the bushing of the oil pump.

    Oil Pump bushing inner diameter torque converter side
    Standard: 40.015—40.040 mm {1.57539—1.57637 in}
    Maximum: 40.060 mm {1.57716 in}

    Oil Pump bushing inner diameter forward clutch side
    Standard: 19.000—19.021 mm {0.74803—0.74885 in}
    Maximum: 19.041 mm {0.74964 in}



B3E0517A322

2. If not as specified, replace the oil pump housing and oil pump cover. (See 05–17–18 OIL PUMP DISASSEMBLY/ASSEMBLY.)

Forward Clutch Preinspection

Clutch operation

1. Set the forward clutch onto the oil pump.

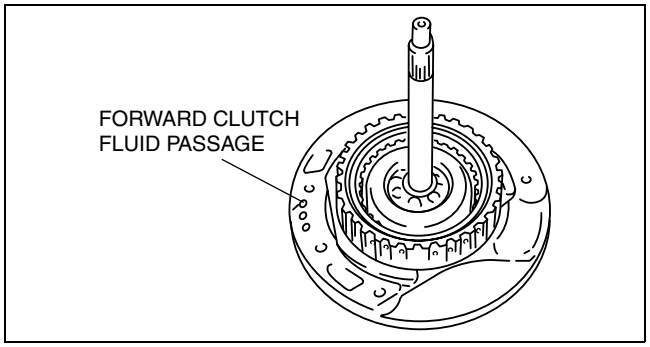
Caution

- **Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.**
  Do not apply compressed air for more than the aforementioned time when testing the system.

2. Inspect the clutch operation by applying compressed air through the fluid passages shown.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

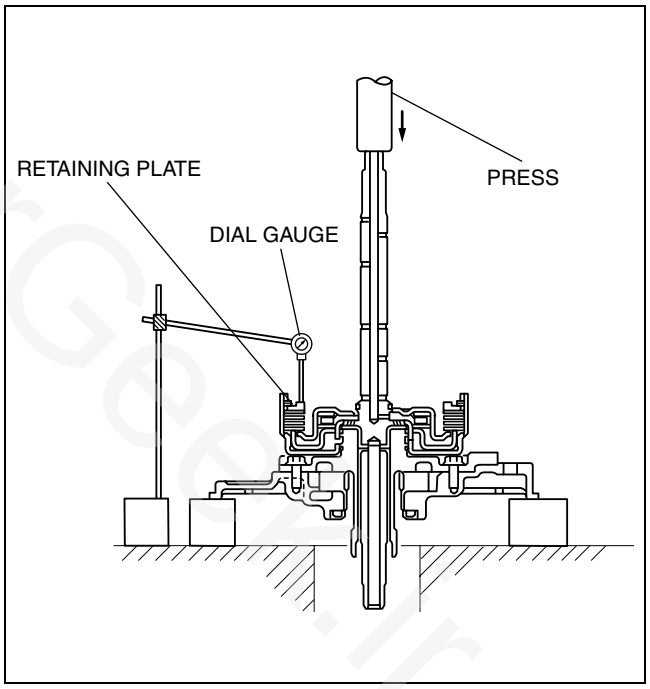
3. If not as specified, replace parts as necessary. (See 05–17–21 FORWARD CLUTCH DISASSEMBLY/ASSEMBLY.)



B3E0517A117

Clutch clearance

1. Measure the forward clutch clearance.
   (1) Install the forward clutch in the oil pump, and set the dial gauge.
   (2) Secure the forward clutch by lightly pressing down with a press, etc.

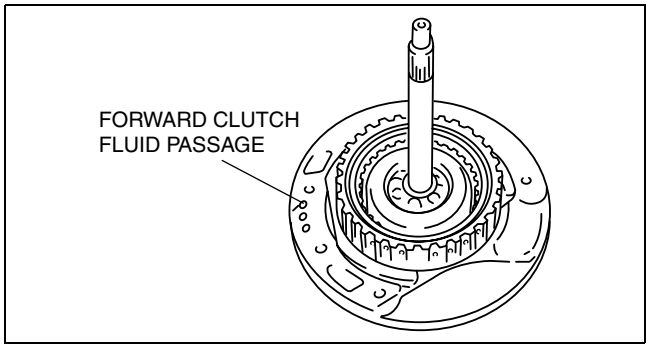


B3E0517A323

   (3) Apply compressed air to the part indicated in the figure and let the forward clutch piston stroke three times.

   Air pressure
   392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}

   (4) Apply compressed air and operate the forward clutch piston. Read the value when the indicator of the dial gauge stops.
   (5) Release the compressed air and read the dial gauge when the forward clutch piston is not operating.

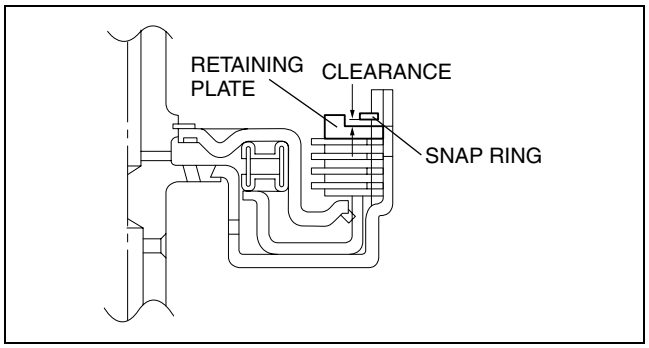


B3E0517A117

(6) Calculate the forward clutch clearance according to the following formula:
Step (4) value – Step (5) value = Forward clutch clearance.
(7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

Forward clutch clearance
1.50—1.80 mm {0.059—0.071 in}

2. If not as specified, replace parts as necessary. (See 05–17–21 FORWARD CLUTCH DISASSEMBLY/ASSEMBLY.)



B3E0517A324

Clutch Component Preinspection
Clutch operation

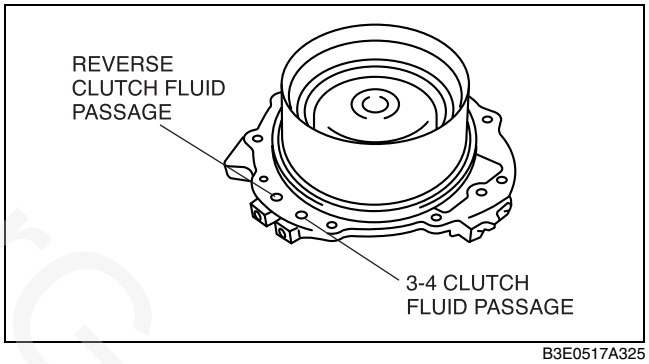
1. Set the clutch component onto the end cover.

Caution
- **Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.**
Do not apply compressed air for more than the aforementioned time when testing the system.

2. Inspect the clutch operation by applying compressed air as shown.

Air Pressure
392 kPa {4.0 kgf/cm^2, 57 psi} max.

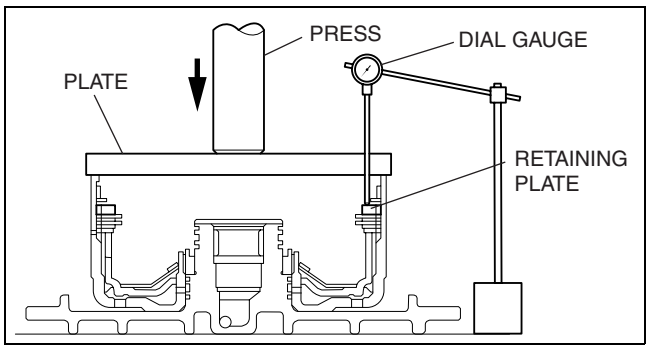
3. If not as specified, replace parts as necessary. (See 05–17–25 CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY.)



B3E0517A325

Reverse clutch clearance

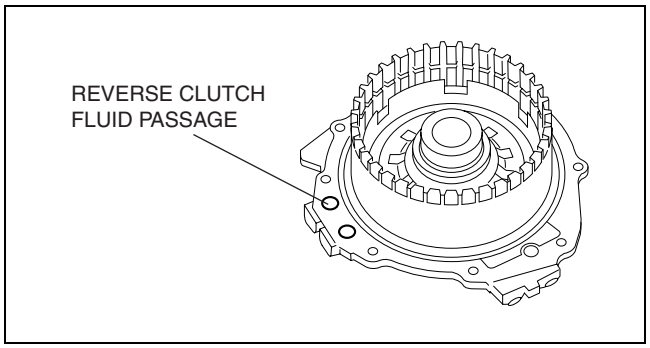
1. Measure the reverse clutch clearance.
   (1) Install the reverse clutch into the end cover, and set the dial gauge.
   (2) Secure the reverse clutch by lightly pressing down with a press, etc.



B3E0517A254

   (3) Apply compressed air to the part indicated in the figure and let the reverse clutch piston stroke three times.

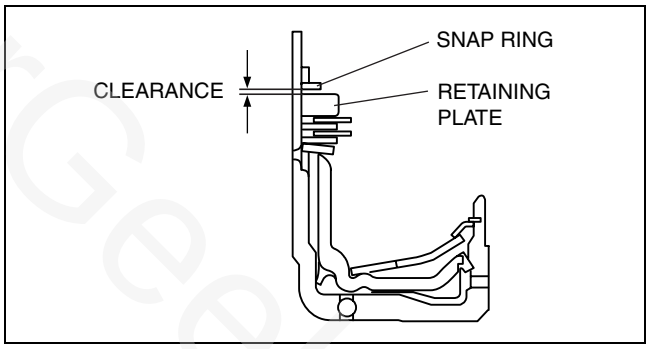
Air Pressure
392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}



B3E0517A255

   (4) Apply compressed air and operate the reverse clutch piston. Read the value when the indicator of the dial gauge stops.
   (5) Release the compressed air and read the dial gauge when the reverse clutch piston is not operating.
   (6) Calculate the reverse clutch clearance according to the following formula: Step (4) value – Step (5) value = Reverse clutch clearance.
   (7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

Reverse clutch clearance
1.00—1.30 mm {0.039—0.051 in}

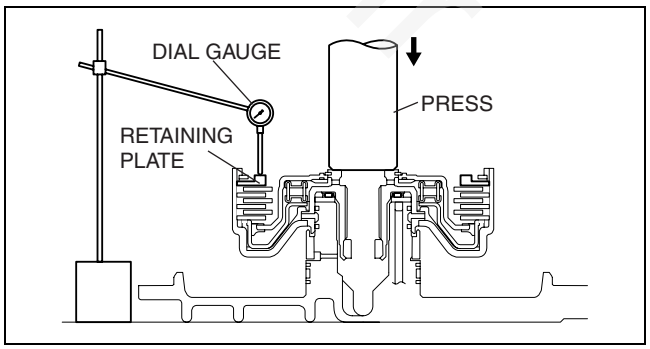


D6E517ZA5106

2. If not as specified, replace parts as necessary. (See 05–17–25 CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY.)

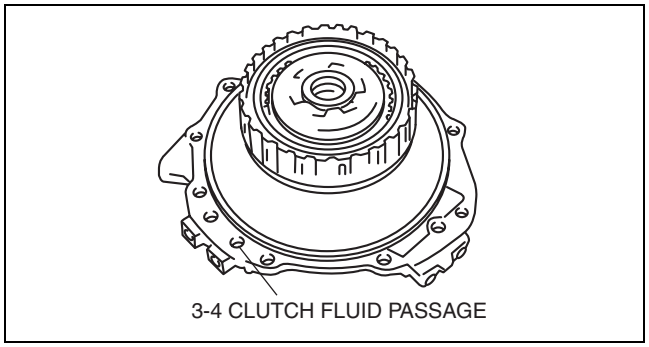
3-4 clutch clearance

1. Measure the 3-4 clutch clearance.
   (1) Install the 3-4 clutch in the end cover and set the dial gauge.
   (2) Secure the 3-4 clutch by lightly pressing down with a press, etc.



B3E0517A261

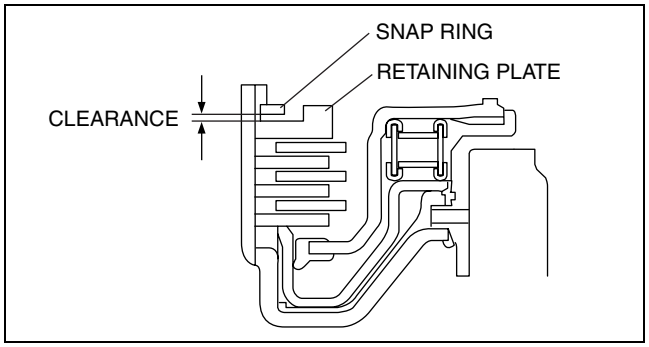
(3) Apply compressed air to the part indicated in the figure and let the 3-4 clutch piston stroke three times.



B3E0517A262

Air pressure
392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}

(4) Apply compressed air and operate the 3-4 clutch piston. Read the value when the indicator of the dial gauge stops.
(5) Release the compressed air and read the dial gauge when the 3-4 clutch piston is not operating.
(6) Calculate the 3-4 clutch clearance according to the following formula:
Step (4) value – Step (5) value = 3-4 clutch clearance.
(7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.



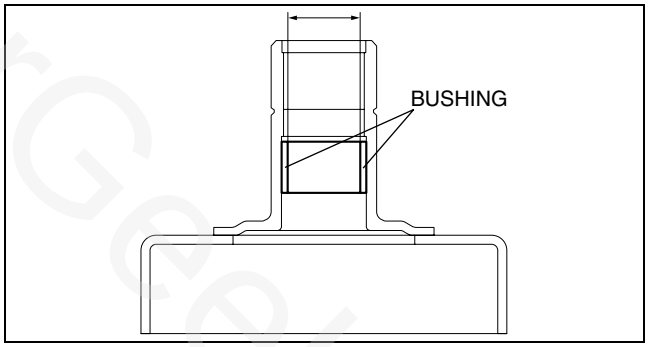
D6E517ZA5107

3-4 clutch clearance
1.10—1.40 mm {0.043—0.055 in}

2. If not as specified, replace parts as necessary. (See 05–17–25 CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY.)

Bushing inner diameter inspection

1. Measure the bushing of the 3-4 clutch hub.

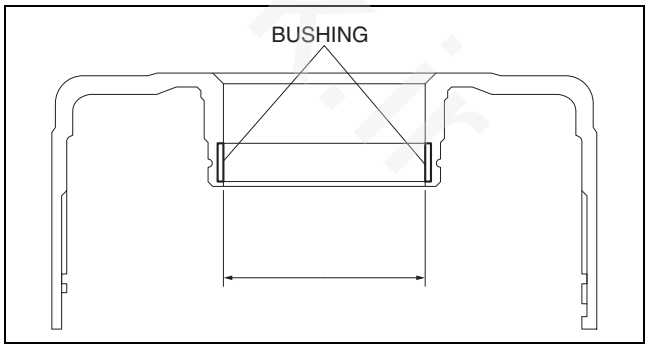


B3E0517A326

3-4 clutch hub bushing inner diameter
Standard: 18.000—18.018 mm {0.70866—0.70936 in}
Maximum: 18.038 mm {0.71016 in}

2. If not as specified, replace the 3-4 clutch hub. (See 05–17–25 CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY.)

3. Measure the bushing of the 2-4 brake drum.



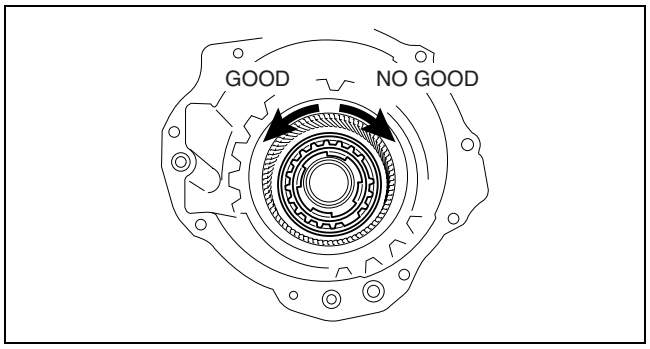
B3E0517A327

2-4 brake drum bushing inner diameter
Standard: 55.005—55.030 mm {2.16555—2.16653 in}
Maximum: 55.050 mm {2.16732 in}

4. If not as specified, replace the 2-4 brake drum. (See 05–17–25 CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY.)

Front Internal Gear and One-Way Clutch No.1 Component Preinspection

1. Set the front internal gear and one-way clutch No.1 component to the one-way clutch inner race. Verify that the one-way clutch rotates smoothly when turned counterclockwise and locks when turned clockwise.
2. If not as specified, replace parts as necessary. (See 05–17–34 FRONT INTERNAL GEAR ONE-WAY CLUTCH NO.1 COMPONENT DISASSEMBLY/ASSEMBLY.)



D6E517ZA5104

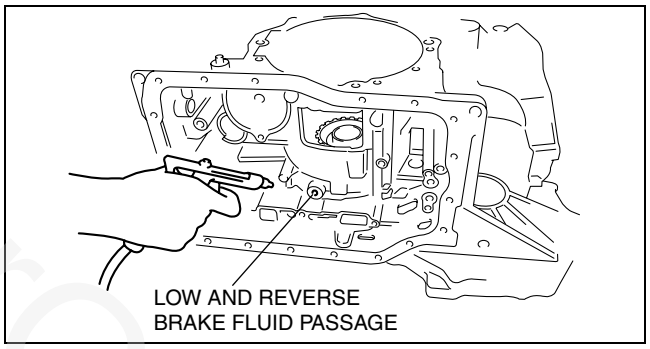
Low and Reverse Brake Preinspection
Brake operation

Caution
- **Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.**
  Do not apply compressed air for more than the aforementioned time when testing the system.

1. Inspect the brake operation by applying compressed air as shown.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

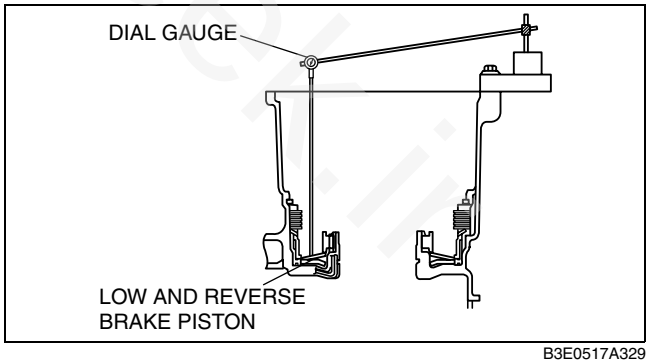
2. If not as specified, replace parts as necessary. (See 05–17–37 LOW AND REVERSE BRAKE AND ONE-WAY CLUTCH INNER RACE DISASSEMBLY/ASSEMBLY.)



D6E517ZA5043

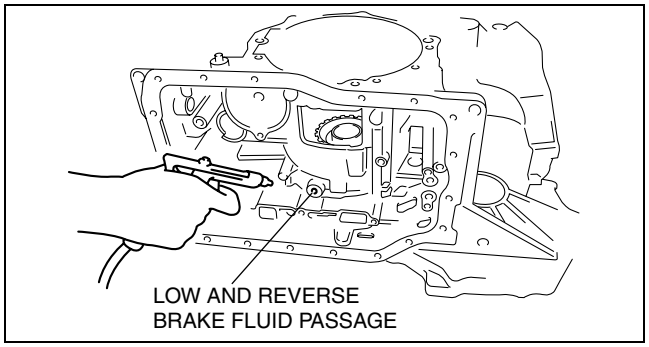
Brake clearance

1. Measure the low and reverse brake clearance.
   (1) Set the dial gauge to the low and reverse brake.
   (2) Set the measuring point of the dial gauge to the low and reverse brake piston.



B3E0517A329

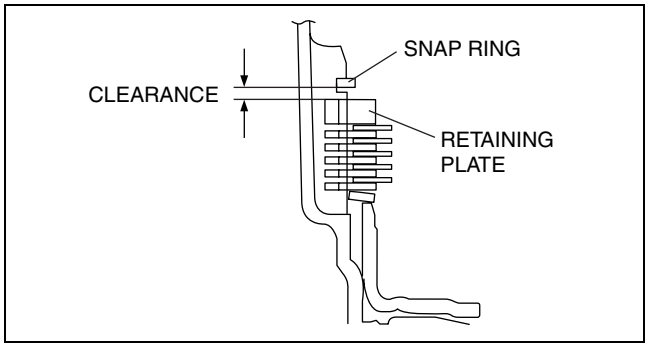
(3) Apply compressed air to the part indicated in the figure and let the low and reverse brake piston stroke three times.



D6E517ZA5043

Air pressure
98.1 kPa {1.0 kgf/cm^2, 14 psi}

(4) Apply compressed air and operate the low and reverse brake piston. Read the value when the indicator of the dial gauge stops.
(5) Release the compressed air and read the dial gauge when the low and reverse brake piston is not operating.
(6) Calculate the low and reverse brake clearance according to the following formula:
Step (4) value – Step (5) value = low and reverse brake clearance.
(7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below:



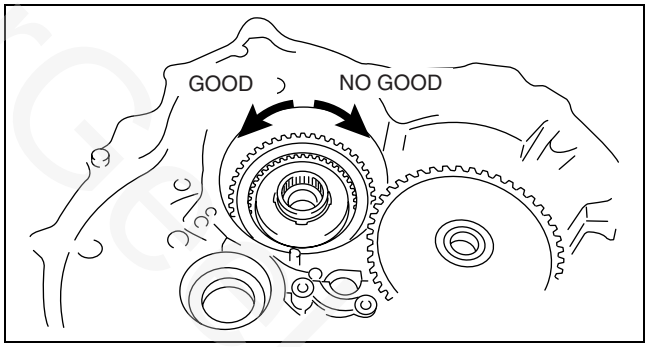
D6E517ZA5047

Low and reverse brake clearance
2.20—2.50 mm {0.087—0.098 in}

2. If not as specified, replace parts as necessary. (See 05–17–37 LOW AND REVERSE BRAKE AND ONE-WAY CLUTCH INNER RACE DISASSEMBLY/ASSEMBLY.)

One-Way Clutch No.2 Component Preinspection

1. Set the one-way clutch No.2 component and direct clutch to the transaxle case. Verify that the one-way clutch rotates smoothly when turned counterclockwise and locks when turned clockwise.
2. If not as specified, replace parts as necessary.



D6E517ZA5105

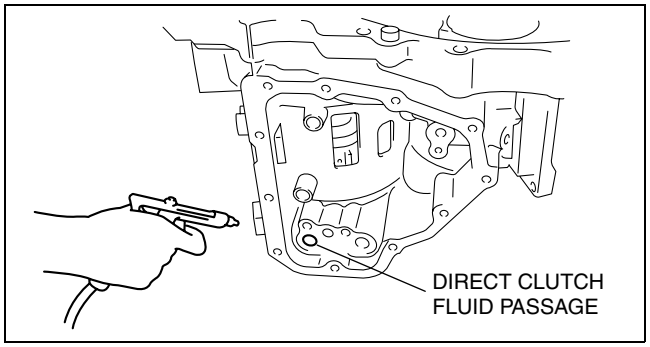
Direct Clutch Preinspection
Clutch operation

1. Set the direct clutch drum onto the transaxle case.

Caution
- **Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.**
  Do not apply compressed air for more than the aforementioned time when testing the system.

2. Inspect the clutch operation by applying compressed air as shown.

   Air pressure
   392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}

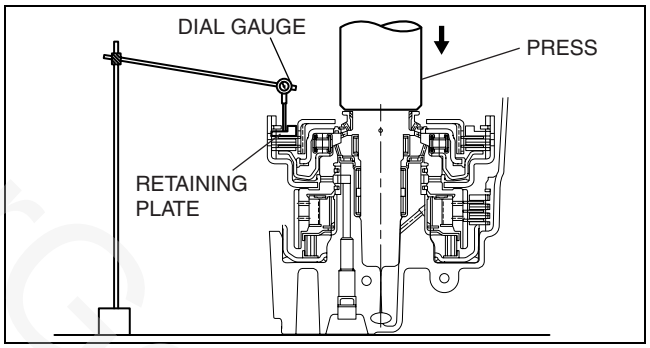


D6E517ZA5050

3. If not as specified, replace parts as necessary. (See 05–17–41 DIRECT CLUTCH DISASSEMBLY/ASSEMBLY.)

Clutch clearance
Measure the direct clutch clearance.

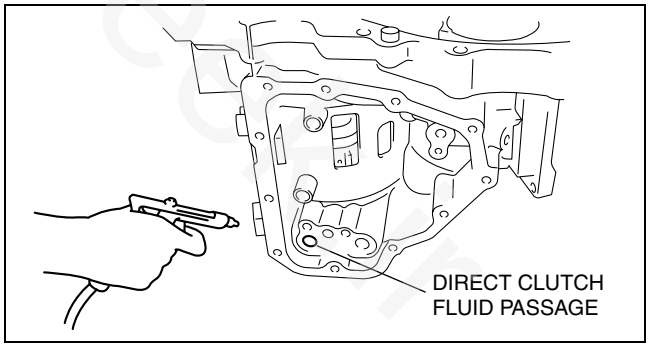
1. Install the direct clutch in the transaxle case, and set the dial gauge.
2. Secure the direct clutch by lightly pressing down with a press or similar tool.



D6E517ZA5052

3. Apply compressed air to the part indicated in the figure and let the direct clutch piston stroke three times.

   Air pressure
   392—441 kPa {4.0—4.5 kgf/cm^2, 57—63 psi}

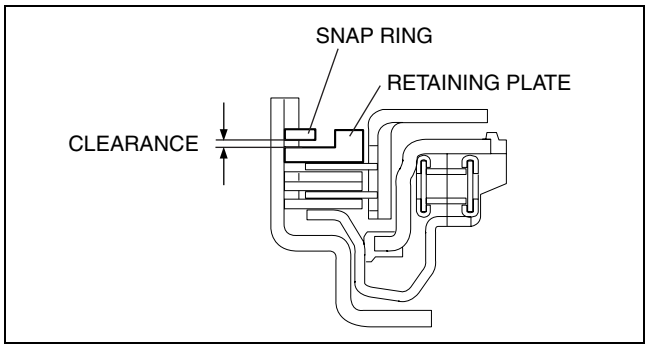


D6E517ZA5050

4. Apply compressed air and operate the direct clutch piston. Read the value when the indicator of the dial gauge stops.
5. Release the compressed air and read the dial gauge when the direct clutch piston is not operating.
6. Calculate the direct clutch clearance according to the following formula:
   step (4) value – step (5) value = direct clutch clearance.
7. Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

   Direct clutch clearance
   Standard: 1.10—1.40 mm {0.043—0.055 in}

8. If not as specified, replace parts as necessary. (See 05–17–41 DIRECT CLUTCH DISASSEMBLY/ASSEMBLY.)



D6E517ZA5053

Reduction Brake Preinspection
Brake operation

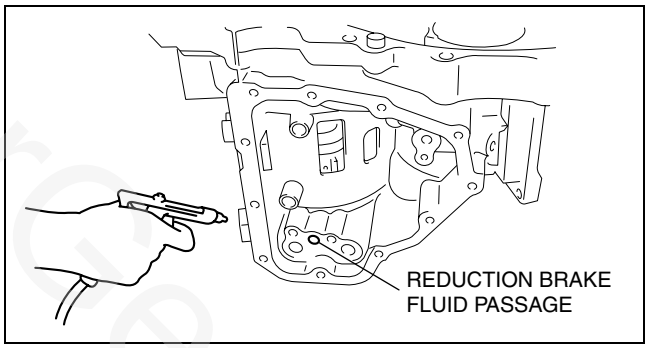
1. Set the direct clutch drum onto the transaxle case.

   Caution
   - **Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.**
     Do not apply compressed air for more than the aforementioned time when testing the system.

2. Inspect the brake operation by applying compressed air as shown.

   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.

3. If not as specified, replace parts as necessary. (See 05–17–46 REDUCTION BRAKE DISASSEMBLY/ASSEMBLY.)

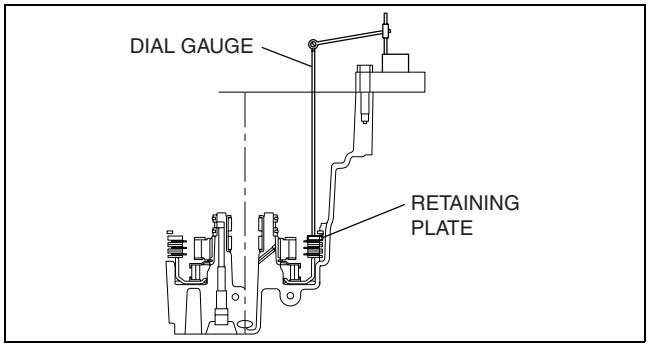


D6E517ZA5055

Brake clearance

Measure the reduction brake clearance.

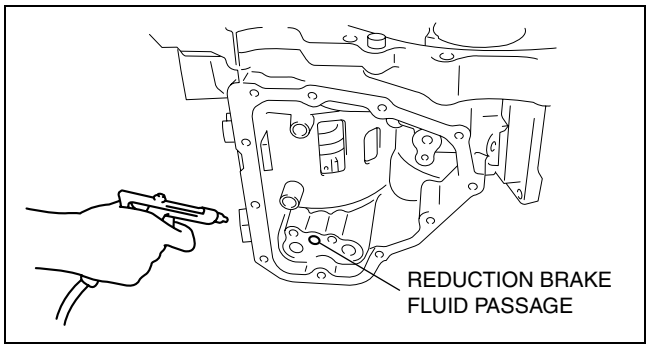
1. Set the dial gauge to the reduction brake.
2. Set the measuring point of the dial gauge to the retaining plate.



D6E517ZA5058

3. Apply compressed air to the part indicated in the figure and let the reduction brake piston stroke three times.

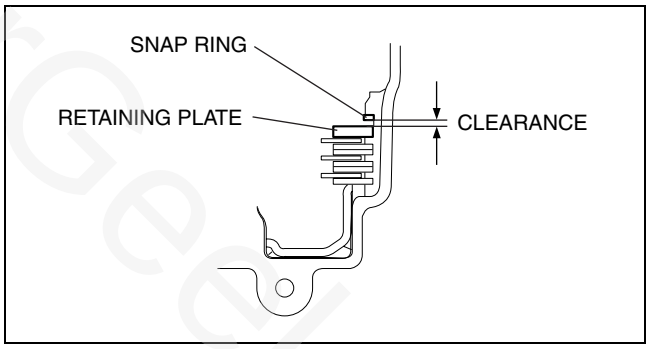
   Air pressure
   392 kPa {4.0 kgf/cm^2, 57 psi} max.



D6E517ZA5055

4. Apply compressed air and operate the reduction brake piston. Read the value when the indicator of the dial gauge stops.
5. Release the compressed air and read the dial gauge when the reduction brake piston is not operating.
6. Calculate the reduction brake clearance according to the following formula:
   Step (4) value—Step (5) value= reduction brake clearance.
7. Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

   Reduction brake clearance
   1.50—1.80 mm {0.059—0.070 in}



D6E517ZA5059

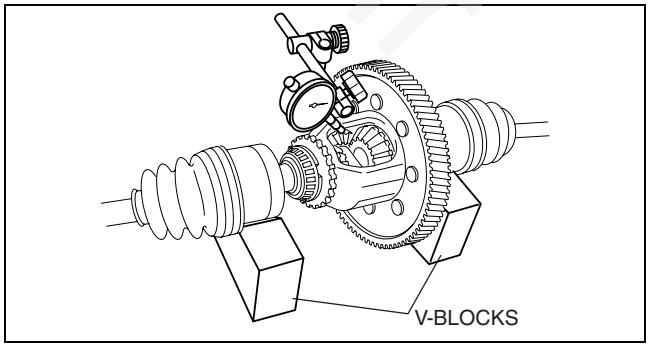
8. If not as specified, replace parts as necessary. (See 05–17–46 REDUCTION BRAKE DISASSEMBLY/ASSEMBLY.)

Differential Preinspection

Backlash

1. Measure the backlash of the side gear.

   Differential backlash
   Standard: 0.05—0.15 mm {0.002—0.005 in}
   Maximum: 0.5 mm {0.020 in}



B3E0517A278

2. If not specified, replace the differential. (See 05–17–75 DIFFERENTIAL DISASSEMBLY/ASSEMBLY.)

05–50 TECHNICAL DATA

TRANSMISSION/TRANSAXLE

E6U055000000A01

Item	Specification
Clearance between the end of the oil pump housing and the outer rotor and inner rotor	Standard: 0.04—0.05 mm {0.0016—0.0019 in} Maximum: 0.05 mm {0.002 in}
Clearance between the outer rotor and the inner rotor	Standard: 0.02—0.11 mm {0.0008—0.0043 in} Maximum: 0.12 mm {0.0047 in}
Forward clutch drive plate thickness	Standard: 1.60 mm {0.063 in} Minimum: 1.45 mm {0.057 in}
Forward clutch springs and retainer component free length	Standard: 17.2 mm {0.677 in} Minimum: 15.2 mm {0.598 in}
Forward clutch clearance	Standard: 1.50—1.80 mm {0.059—0.070 in}
Reverse clutch drive plate thickness	Standard: 1.60 mm {0.063 in} Minimum: 1.45 mm {0.057 in}
3-4 clutch drive plate thickness	Standard: 2.55 mm {0.100 in} Minimum: 2.40 mm {0.094 in}
3-4 clutch driven plate thickness	Standard: 2.55 mm {0.100 in} Minimum: 2.40 mm {0.094 in}
3-4 clutch springs and retainer component free length	Standard: 17.2 mm {0.677 in} Minimum: 15.2 mm {0.598 in}
Rear sun gear bushing inner diameter	Standard: 29.900—29.921 mm {1.17717—1.17799 in} Maximum: 29.941 mm {1.17878 in}
Reverse clutch clearance	Standard: 1.00—1.30 mm {0.039—0.051 in}
3-4 clutch clearance	Standard: 1.10—1.40 mm {0.043—0.055 in}
Low and reverse brake drive plate thickness	Standard: 1.60 mm {0.063 in} Minimum: 1.45 mm {0.057 in}
Low and reverse brake clearance	2.20—2.50 mm {0.087—0.098 in}
Direct clutch drive plate thickness	Standard: 1.80 mm {0.071 in} Minimum: 1.65 mm {0.065 in}
Direct clutch springs and retainer component free length	Standard: 17.2 mm {0.677 in} Minimum: 15.2 mm {0.598 in}
Direct clutch clearance	Standard: 1.10—1.40 mm {0.043—0.055 in}
Reduction brake drive plate thickness	Standard: 1.80 mm {0.071 in} Minimum: 1.65 mm {0.065 in}
Reduction brake springs and retainer component free length	Standard: 18.2 mm {0.717 in} Minimum: 16.2 mm {0.638 in}
Reduction brake clearance	1.50—1.80 mm {0.059—0.070 in}
Differential backlash	Standard: 0.05—0.15 mm {0.002—0.005 in} Maximum: 0.5 mm {0.020 in}
Differential bearing Preload	Preload: 1.4—2.3 N·m {14—24 kgf·cm, 12—20 in·lbf} Reading on pull scale: 14—23 N {1.4—2.4 kgf, 3.1—5.3 lbf}
Front sun gear bushing inner diameter	Standard: 18.000—18.018 mm {0.70866—0.70936 in} Maximum: 18.038 mm {0.71016 in}
End cover bushing inner diameter	Standard: 23.600—23.621 mm {0.92913—0.92995 in} Maximum: 23.641 mm {0.93075 in}
Secondary sun gear bushing inner diameter	Standard: 26.000—26.021 mm {1.02362—1.02445 in} Maximum: 26.041 mm {1.02524 in}
Primary gear preload	0.50—0.90 N·m {5.10—9.17 kgf·cm, 4.42—7.96 in·lbf}
Between the end of the torque converter and the end of the converter housing	21.4 mm {0.84 in}
Oil Pump bushing inner diameter torque converter side	Standard: 40.015—40.040 mm {1.57539—1.57637 in} Maximum: 40.060 mm {1.57716 in}
Oil Pump bushing inner diameter forward clutch side	Standard: 19.000—19.021 mm {0.74803—0.74885 in} Maximum: 19.041 mm {0.74964 in}
3-4 clutch hub bushing inner diameter	Standard: 18.000—18.018 mm {0.70866—0.70936 in} Maximum: 18.038 mm {0.71016 in}
2-4 brake drum bushing inner diameter	Standard: 55.005—55.030 mm {2.16555—2.16653 in} Maximum: 55.050 mm {2.16732 in}

Accumulator spring (standard)

Spring	Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
Servo apply accumulator large spring	21.0 {0.827}	67.8 {2.669}	10.3	3.5 {0.138}
Servo apply accumulator small spring	13.0 {0.512}	67.8 {2.669}	17.1	2.2 {0.087}
Forward accumulator large spring	21.0 {0.827}	75.0 {2.953}	10.7	2.3 {0.091}
Forward accumulator small spring	15.6 {0.614}	49.0 {1.929}	7.7	2.4 {0.094}

Snap ring size for forward clutch clearance

Range mm {in}	Snap ring sizes mm {in}
2.810—3.010 {0.111—0.118}	1.2 {0.047}
3.010—3.210 {0.119—0.126}	1.4 {0.055}
3.210—3.410 {0.127—0.134}	1.6 {0.063}
3.410—3.610 {0.135—0.142}	1.8 {0.071}
3.610—3.810 {0.143—0.150}	2.0 {0.079}
3.810—4.010 {0.150—0.157}	2.2 {0.087}

Snap ring size for reverse clutch clearance

Range mm {in}	Snap ring sizes mm {in}
2.370—2.570 {0.094—0.101}	1.2 {0.047}
2.570—2.770 {0.102—0.109}	1.4 {0.055}
2.770—2.970 {0.110—0.116}	1.6 {0.063}
2.970—3.170 {0.117—0.124}	1.8 {0.071}
3.170—3.370 {0.125—0.132}	2.0 {0.079}
3.370—3.570 {0.133—0.140}	2.2 {0.087}

Snap ring size for 3-4 clutch clearance

Range mm {in}	Snap ring sizes mm {in}
2.400—2.600 {0.095—0.102}	1.2 {0.047}
2.600—2.800 {0.103—0.110}	1.4 {0.055}
2.800—3.000 {0.111—0.118}	1.6 {0.063}
3.000—3.200 {0.119—0.125}	1.8 {0.071}
3.200—3.400 {0.126—0.133}	2.0 {0.079}
3.400—3.600 {0.134—0.141}	2.2 {0.087}

Servo return spring (Standard)

Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
34.0 {1.340}	36.4 {1.430}	2.5	4.0 {0.160}

Snap ring size for low and reverse brake clearance

Range mm {in}	Snap ring sizes mm {in}
4.050—4.250 {0.159—0.167}	1.8 {0.071}
4.250—4.450 {0.167—0.175}	2.0 {0.079}
4.450—4.650 {0.175—0.183}	2.2 {0.087}
4.650—4.850 {0.183—0.190}	2.4 {0.094}
4.850—5.050 {0.190—0.199}	2.6 {0.102}
5.050—5.250 {0.199—0.207}	2.8 {0.110}
5.250—5.450 {0.207—0.215}	3.0 {0.118}

Snap ring size for direct clutch clearance

Range mm {in}	Snap ring sizes mm {in}
2.424—2.624 {0.096—0.103}	1.2 {0.047}
2.624—2.824 {0.104—0.111}	1.4 {0.055}
2.824—3.024 {0.112—0.119}	1.6 {0.063}
3.024—3.224 {0.120—0.126}	1.8 {0.071}
3.224—3.424 {0.127—0.134}	2.0 {0.079}
3.424—3.624 {0.135—0.142}	2.2 {0.087}

Snap ring size for reduction brake clearance

Range mm {in}	Snap ring sizes mm {in}
2.920—3.120 {0.115—0.122}	1.2 {0.047}
3.120—3.320 {0.123—0.130}	1.4 {0.055}
3.320—3.520 {0.131—0.138}	1.6 {0.063}
3.520—3.720 {0.139—0.146}	1.8 {0.071}
3.720—3.920 {0.147—0.154}	2.0 {0.079}
3.920—4.120 {0.155—0.162}	2.2 {0.087}

Primary control valve body spring (standard)

Item	Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
Low and reverse shift valve spring	8.7 {0.343}	31.3 {1.232}	9.0	0.8 {0.031}
Solenoid reducing valve spring	8.7 {0.343}	44.2 {1.740}	16.0	1.1 {0.043}
Pressure regulator valve spring	7.9 {0.311}	36.3 {1.429}	13.2	0.9 {0.035}
Solenoid shift valve spring	8.3 {0.327}	35.1 {1.382}	12.0	0.6 {0.024}
Converter relief valve spring	9.0 {0.354}	42.5 {1.673}	14.2	1.3 {0.051}
Torque converter clutch control valve spring	8.7 {0.343}	31.3 {1.232}	9.0	0.8 {0.031}
Bypass valve spring	8.7 {0.343}	31.3 {1.232}	9.0	0.8 {0.031}
3–4 shift valve spring	8.7 {0.343}	31.3 {1.232}	9.0	0.8 {0.031}
Pressure modifier accumulator spring	11.0 {0.433}	23.0 {0.906}	6.6	1.5 {0.059}

Secondary control valve body spring (standard)

Item	Outer diameter mm {in}	Free length mm {in}	No. of coils	Wire diameter mm {in}
4–5 shift valve spring	8.7 {0.343}	27.0 {1.063}	10.7	0.8 {0.031}
4/5 accumulator large spring	21.2 {0.835}	72.2 {2.843}	14.0	2.6 {0.102}
4/5 accumulator small spring	15.2 {0.598}	53.7 {2.114}	11.9	3.2 {0.126}

Differential preload adjust shims (mm {in})

0.50 {0.020}	0.55 {0.022}	0.60 {0.024}
0.65 {0.026}	0.70 {0.028}	0.75 {0.030}
0.80 {0.031}	0.85 {0.033}	0.90 {0.035}
0.95 {0.037}	1.00 {0.039}	1.05 {0.041}
1.10 {0.043}	1.15 {0.045}	1.20 {0.047}
1.25 {0.049}	1.30 {0.051}	1.35 {0.053}
1.40 {0.055}	1.45 {0.057}	1.50 {0.059}
1.55 {0.061}	–	–

Band strut length for 2-4 brake band servo stroke (mm {in})

36.0 {1.417}	36.5 {1.437}	37.0 {1.457}
37.25 {1.467}	37.5 {1.476}	37.75 {1.486}
38.0 {1.496}	38.25 {1.506}	38.5 {1.516}
39.0 {1.535}	–	–

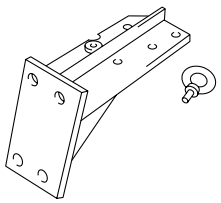
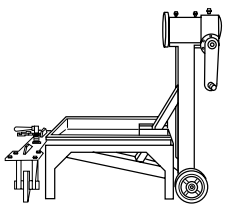
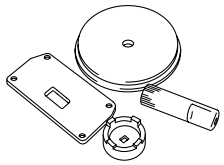
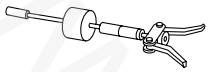
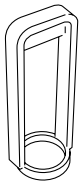
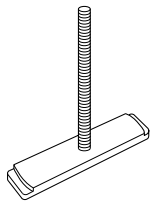
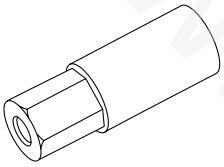
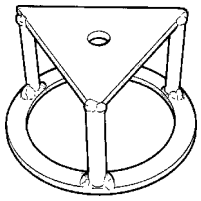
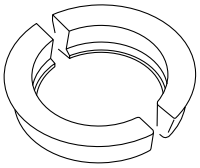
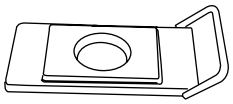
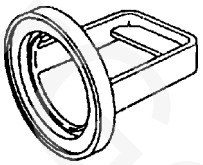
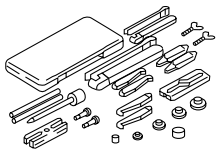
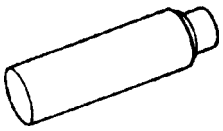
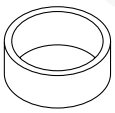
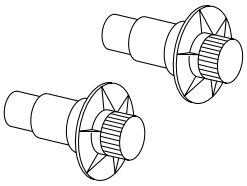
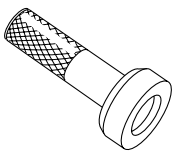
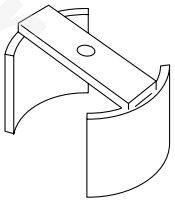
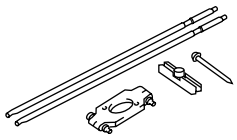
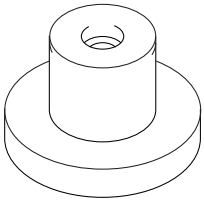
Adjust shim size for output gear component total end play

total end play {in}	Adjust shims sizes mm {in}
1.431—1.481 {0.057—0.058}	1.20 {0.047}
1.381—1.431 {0.055—0.056}	1.15 {0.045}
1.331—1.381 {0.053—0.054}	1.10 {0.043}
1.281—1.331 {0.051—0.052}	1.05 {0.041}
1.231—1.281 {0.049—0.050}	1.00 {0.039}
1.181—1.231 {0.047—0.048}	0.95 {0.037}
1.131—1.181 {0.045—0.046}	0.90 {0.035}
1.081—1.131 {0.043—0.044}	0.85 {0.033}
1.031—1.081 {0.041—0.042}	0.80 {0.031}
0.981—1.031 {0.039—0.040}	0.75 {0.029}
0.931—0.981 {0.037—0.038}	0.70 {0.028}
0.881—0.931 {0.035—0.036}	0.65 {0.026}
0.831—0.881 {0.033—0.034}	0.60 {0.024}
0.781—0.831 {0.031—0.032}	0.55 {0.022}
0.731—0.781 {0.029—0.030}	0.50 {0.020}

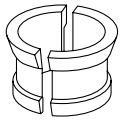
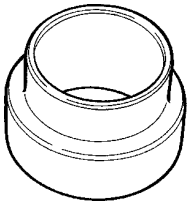
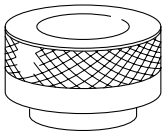
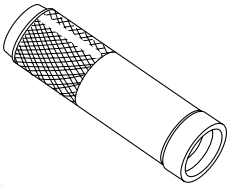
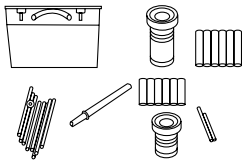
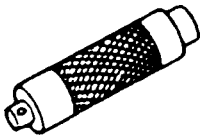
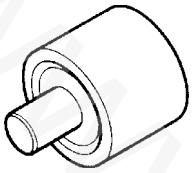
05–60 SERVICE TOOLS

TRANSMISSION/TRANSAXLE SST

E6U056000000A01

49 B019 010A Transmission Hanger 	49 0107 680A Engine Stand 	49 B019 0A1A Lock Nut Remover Set 
49 W032 2A0 Bearing Remover Set 	49 B019 012 Return Spring Compressor 	49 G019 027 Attachment A 
49 G019 029 Nut 	49 W019 002 Body 	49 B017 209 Attachment J 
49 F401 366A Plate 	49 B025 003 Sensor Rotor Installer 	49 0839 425C Bearing Puller Set 
49 E032 303 Bearing Installer 	49 S231 626 Support Block 	49 G030 338 Attachment E 
49 G030 455 Diff Side Gear Holder 	49 0500 330 Bearing Installer 	49 B019 011 Return Spring Compressor 
49 0727 415 Bearing Installer 	49 0187 520 Rear Axle Shaft Bearing Puller 	49 F026 102 Bearing Installer 

SERVICE TOOLS

49 T019 007 Attachment 	49 F401 337A Attachment C 	49 UB71 525 Bearing Installer 
49 F401 331 Body 	49 B019 0A3 Shim Selector Set 	49 G030 797 Handle 
49 F028 202 Bush Installer 	49 G030 796 Body 	–